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## Power Plant Problems of Steel Mills

Efficiency of Various Forms of Prime Movers—Importance of Frequency—Blowing and Electric Generating Equipment—Selling Off-Peak Power

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ANY decided reduction in the cost of power required to produce a ton of steel in the finished state will vary the total cost per ton only a fraction of a per cent, as considered by past practice, yet this item is fast becoming of more importance. Rising costs of coal, difficulties of transportation and the possibilities of closer margin of profit have quickened the effort to utilize all available heat units. It is a common mistake for the engineer to design a power plant of good efficiency, yet lose sight of the fact that the investment must be as low as possible. Operating costs and interest costs should never be separated. One is as much a part of the cost of energy as the other. The lowering of the cost of production in a power plant depends on getting the maximum work out of the investment; consequently, to meet the competition now offered by the central stations and to care for the increasing demands of the steel industry successfully, the power engineering must follow a broad and comprehensive policy.

It is the purpose of this paper to indicate in a general manner some of the important economic considerations. For this purpose certain assumptions have been made. The plan assumed consists of five 500-ton blast furnaces, two of which supply the foundry and the others the open-hearth plant. The foundry is equipped with complete mechanical system. The mills consist of 40-inch blooming, 24-inch continuous mill and two 12-inch continuous mills. The yearly production assumed for the mills is 600,000 tons of steel. Operation schedule of the mills and foundry calls for 310 days per year. Fig. 1 shows the expected electrical load curve for this plant. The motors were carefully chosen to avoid oversizing. The energy consumption from ore to finished steel per ton is estimated at around 67 kwhr., and from ore to finished castings at

the foundry the energy consumption is 32.5 kwhr.

To take care of this load condition two 10,000-kw. units will be required a greater portion of the time, and a third is installed as a spare, so that the generating equipment assumed consists of three 12,500-kva., 0.80 per cent power factor, 60-cycle, 6600-volt turbine generator units. The maximum probable peak demand will be 19,000 to 20,000 kw. Since the cost of a power plant depends so very much upon the maximum load it must carry, careful consideration must be given to the expected peak load, as this is usually estimated too high.

Frequency in steel mill plants is of special importance.

The lower speed limit for 60-cycle motors has been pushed considerably downward and the tendency seems to be strongly toward this frequency as a standard. For main rolls 60-cycle motors cost about 10 per cent more than the 25-cycle type, but elsewhere the 60-cycle are less expensive and more efficient in operation. In the case of a new plant, even where it is expected to generate all its own power, 60-cycle equipment should be installed, if located in a 60-cycle district. In

additions to existing plants, it is advisable to install 60-cycle equipment if the added capacity is as much as 50 per cent of the existing capacity. The only condition in which two frequencies should be mixed in one plant is that one of them is to be abandoned entirely within a reasonably short time.

Transmission of energy at 6600 volts is economical up to about 6.5 miles. It is usual now in new plants to generate and transmit at this voltage. The expense of installing and operating sub-stations must be justified by the savings made in the shortening of the distribution feeders. The location of sub-stations should be as near as possible to the center of consumption of the district to be served. By studying the operation schedule, the expected yearly energy consumption of each motor or group of motors doing similar duties

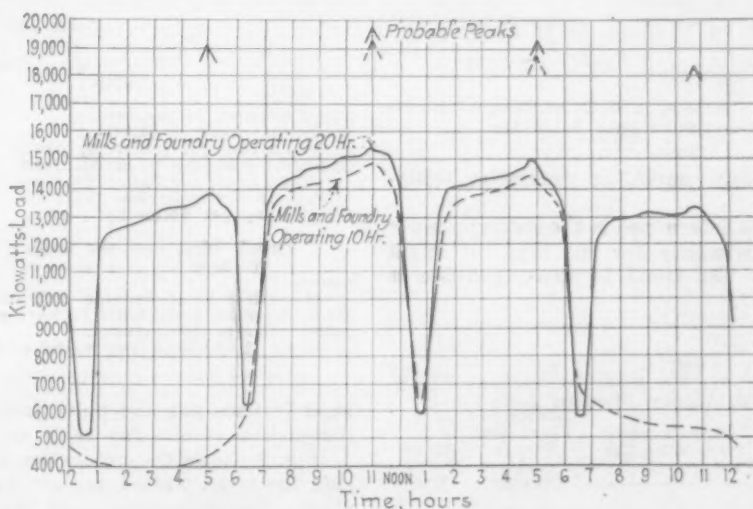


Fig. 1—Expected Daily Load Curve from Midnight to Midnight, Showing the Total A. C. Load When the D. C. Demands Are Cared for by Conversion in Substations. Just when the peak loads will occur is unknown and there is a diversity factor between the a. c. and d. c. peaks. Solid lines cover 20-hr. operation of the mills and foundries; dotted lines, 10-hr. operation

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may be found. Knowing the consumption and location of the motors, the center of energy consumption for any sub-station group may be found by theory of moments. This method gives more accurate results than the method of assuming demand factors. Careful study of diversity factors between feeders and sub-stations must be made, since the utilization of this

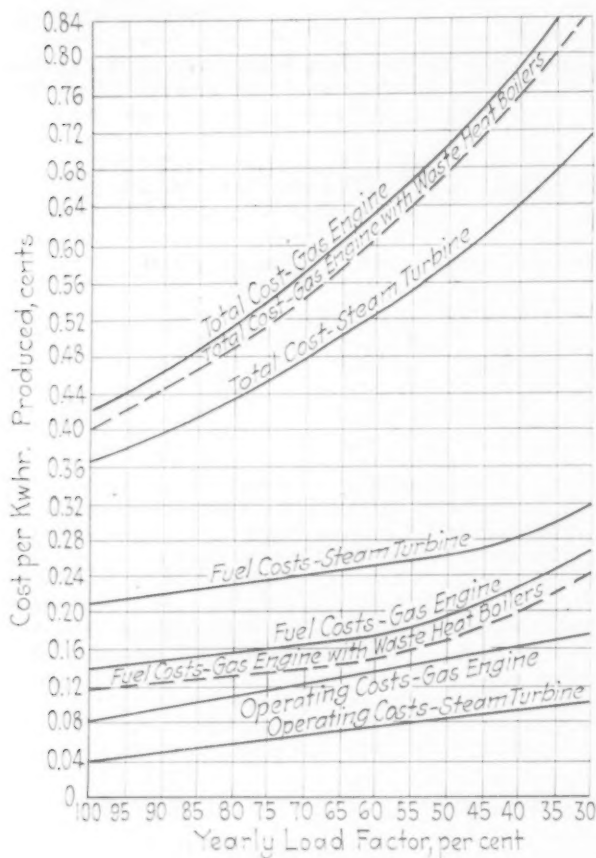


Fig. 2—Comparison of Operating and Total Costs of Plants of Varying Description (See Table II)

factor allows considerable saving in generating equipment.

One condition to be determined is the steam pressure and temperature satisfactory for the type of plant under consideration. The trend in steam practice is

Table I  
Heat Consumption B.t.u. Per Net Kw-hr. for Stations Supplying 15,000 Kw. Average Working Load

	Gas Engine Plant With Gas Producer Reserve	Gas Engine Plant With Steam Turbine Equalizer	Steam Turbine Plant
Direct Heat Consumption of main units..	17,600	20,060	19,600
Gas washers.....	500	500	400
Auxiliary pumps.....	350	350	350
Igniters, direct connected, exciters, etc.	0	0	0
Total B.t.u. per net kw-hr. ....	18,450	20,910	20,350
Efficiency of main unit, per cent.....	19.4	17.0	17.4
Efficiency of plant, per cent.....	18.50	16.38	16.81
Most gas engine people insist that efficiency of 20 per cent is correct. The table gives both 20 per cent and 17 per cent, which seems more nearly correct.			
Steam at 250 lb. per sq. in. gage, 250 deg. Fahr. superheat, 29 in. vacuum.			

toward higher pressure rather than extreme superheat. It is more difficult to design equipment to withstand continuous operation at high temperature than at high pressure. The amount of heat available for conversion into work, when expanding to a certain vacuum, is greater for high pressure and moderate superheat than for lower pressure and correspondingly higher superheat. Several plants are now operating at 350 lb. steam pressure with a total temperature of about 750

deg., and there are under construction plants for 650 lb. pressure and 750 deg. total temperature. Due to the decrease in the tensile strength and elastic limit of the metals used, at temperatures above 750 deg., that seems to be the limit of temperature. A pressure of 250 lb. with a total temperature of 600 deg. corresponds to the latest steel plant practice.

The choice of blowing or generating equipment is entirely an economic question, as all general types are in successful operation. Considerable progress in heat economy of turbo blowers and turbo generator units has been made in recent years, while at the same time

Table II  
Cost of Plants, in 1921

	Total Cost	Cost per kw. Fixed Charges Per Cent
Steam plant.....	\$5,100,000	\$113 12
Gas engine plant...	6,700,000	150 13
Gas engine plant with waste heat boilers .....	7,420,000	166 13 1/4
Coal of 12,500 B.t.u. per lb. to cost \$2.50 per ton, f.o.b. plant.		
Distribution cost 0.07c. per kw-hr., not shown.		

improvements have been made in the design of boilers and auxiliary apparatus. Table I shows the heat consumption per kw-hr. produced for a gas engine plant, a steam turbo plant and a gas engine plant with turbine equalizer for an average load of 15,000 kw.

Fig. 2 shows the operating, fuel and total costs per kw-hr. produced by the steam plant, gas engine plant and the gas engine plant with waste heat boilers, plotted against yearly load factor. Air horsepower in the blast is converted to equivalent kw-hr. for this comparison. The steam used in the turbo generator unit per kw-hr. produced was divided into the quantity of steam used by the turbo blower unit, to give equivalent kilowatt units. In this comparison large boilers using

Table III

Equipment Type	6 Gas Fired Boilers, 4 Stoker Fired Boilers	5 Gas and Pulverized Coal Fired Boilers
Fixed charges, 15 per cent.....	\$225,000	\$140,000
Boiler hp. years produced.....	28,300	26,600
Fixed charges per boiler hp. year	\$8.00	\$5.35
Operating costs per boiler hp. year	8.00	8.27*
Total costs per boiler hp. year	16.00	13.62
Fuel costs per boiler hp. year...	38.30	35.70
Fuel saving per boiler hp. year..	None	Credit 3.60†
Grand total cost per boiler hp. year .....	\$54.30	\$45.72

\*Figuring blast furnace gas costing same as coal per B.t.u. supplied, since blast furnace gas is usually charged to power costs in this manner.

†Coal 12,500 B.t.u. per pound at \$2.50 per ton.

blast furnace gas and pulverized coal were used. This comparison results favorably to the steam plant.

Fig. 3 shows the production costs at assumed plant load factor as plotted against coal cost per ton at the plant. The intersections of the total operating costs for the different types of equipment give the costs of coal at which total costs are the same. The higher the load factor the lower the cost of coal at the intersec-

Table IV  
Operating Cost Comparisons

Item	Stoker Equipment	Pulverized Coal Equipment
Yard switching.....	7.0c.	7.0c.
Coal unloading and distributing..	8.0	2.0
Labor—Coal preparation.....	0.0	14.3
Piling .....	14.0	11.2
Ash removal.....	7.1	2.5
Electric energy.....	3.3	6.8
Dryer fuel.....	0.0	5.1
Maintenance .....	9.0	6.3
Total cost per ton fired....	48.4	55.2
Extra cost of installation of stoker equipment and boiler for it, \$434,000.		

tions, thereby showing effect of heat economy of the gas engine at high loads.

If there are no local conditions prohibiting the use of surface condensers, this type of condenser should

be used. A comparison made for this assumed installation resulted favorably to the surface condenser as the most economical investment, but only by a small amount. There is not enough in its favor to offset any local conditions existing which are undesirable for sur-

Table VI  
Estimated Cost of Complete Power System for Two Types of Equipment

Type of Equipment	6 Gas Fired Boilers, 4 Stoker Fired Boilers	5 Gas and Pulverized Coal Fired Boilers
Station capacity, kw.....	30,000	30,000
Number of blowers.....	6	6
Excavations and foundations....	\$500,000	\$400,000
Power house building—steel and brick .....	560,000	420,000
Boilers with superheaters, stacks and settings .....	954,000	650,000
Gas cleaners, piping and burners .....	450,000	450,000
Stokers, fans, ducts, etc.....	120,000	.....
Induced and forced draft fans...	75,000	.....
Pulverized coal equipment complete .....	.....	100,000
Pulverized coal equipment building .....	.....	15,000
Coal storage, crane, ash handling .....	50,000	40,000
Feed water heaters.....	18,000	18,000
Make-up evaporator plant.....	25,000	25,000
Turbine generators and air washers .....	640,000	640,000
Turbo blowers .....	780,000	780,000
Condensers for generating and blower units, including pumps and exhaust connections....	390,000	390,000
Pump and screen house, tunnel..	430,000	430,000
Piping and covering.....	150,000	100,000
Exciters, motor-generator sets, switching, transformers and yard wiring .....	125,000	125,000
Gages, meters, etc.....	25,000	25,000
Cranes (2) .....	20,000	20,000
Construction plant equipment...	25,000	25,000
Total direct items.....	\$5,337,000	\$4,653,000
Contingencies, 5 per cent.....	266,850	233,200
Engineering and supervision, 10 per cent .....	\$5,603,850	\$4,886,200
Interest during construction, 5 per cent .....	506,385	488,620
Grand total .....	\$6,110,235	\$5,374,820
Fixed charges, 12 per cent.....	305,500	268,741
Fixed charges per kw-hr.*.....	\$6,416,000	\$5,644,000
Cost per kw. capacity (equivalent) .....	769,920	677,280
	0.32c.	0.28c.
	\$139	\$122

\*Assuming 158,000,000 kw-hr. equivalent to blowing of furnaces, + 10 per cent auxiliaries. Total 236,000 kw-hr. produced per year. This corresponds to a load factor per year of about 40 to 45 per cent, as determined from load curves and operation schedule for plant.

face condensers. The power house should be designed with the boiler room as the middle section, turbo blowers in one side section and the turbo generators in the other side section. The boilers should be elevated so that ashes may be dumped directly into standard railroad cars at yard level. The condenser floor line for both turbo blowers and turbo generators should be at or near the ground level. On a floor above the turbo blowers the evaporator and feed water heaters should be installed, with control and switching equipment on a floor above the turbo generators. This type of design gives the least building wall surface and volume, consequently the lowest cost for the installed capacity. One of the points impressed by a visit to a few European power plants was the considerable saving in building costs per unit of capacity as compared to American power plants, yet without loss of architectural harmony with the vicinity.

The most efficient load on boilers in point of fuel costs is around 180 per cent rating. The return on the investment will increase with the capacity secured, while labor costs will decrease to a point where the decrease in efficiency will offset such added return. The rating of the boiler units and the number of units should be chosen so that the 10 or 12-hr. load may be carried at or near the most efficient boiler rating, and at the same time have sufficient capacity to carry the maximum load which may be carried on the station.

The steady load on this assumed station is 17,500 boiler hp. which at 190 per cent rating calls for four 2250-hp. boilers. One 500-ton blast furnace will supply enough furnace gas over the stove requirements to operate one of these units continuously at 165 per cent rating.

Adding pulverized coal equipment to operate under the same units provides a method of caring for boiler load fluctuations at better economy, and thereby reducing capital investment considerably without any large increase in the attendance required. Lower grades of coal may be used and in addition large percentages of breeze coke coming from the by-product coke plant. Table III gives a comparison of the total cost per boiler hp. year produced by the two types of boiler equipment. Table IV gives a comparison of the cost per ton of coal fired in stoker and pulverized equipment. Table V gives the detailed estimated plant steam consumption. Five fuels—blast furnace gas, coke oven gas, tar, coke and coal—have been burned simultaneously with good efficiency under the same boiler. This provides a method of promptly caring for load fluctuations, and fuller utilization of all by-products. This method provides for considerable fuel savings and may indicate future tendencies.

Connection with a central station system, because of the diversity factor, allows a reduction in the reserve generating equipment, even if no energy is normally interchanged. The sale of surplus energy increases the rate at which the investment is worked, at practically no labor cost increase, and thereby holds the prospect of some profit, depending upon the conditions at hand. In the assumed plant with one furnace out of blast, the blast furnace gas will care for the blast and, in addition, 7500 kw. load at time of tapping (one furnace at a time) and 10,000 kw. for the remaining time. Thus 3000 kw. for 13 hr. and 6000 kw. for 4 hr. must be

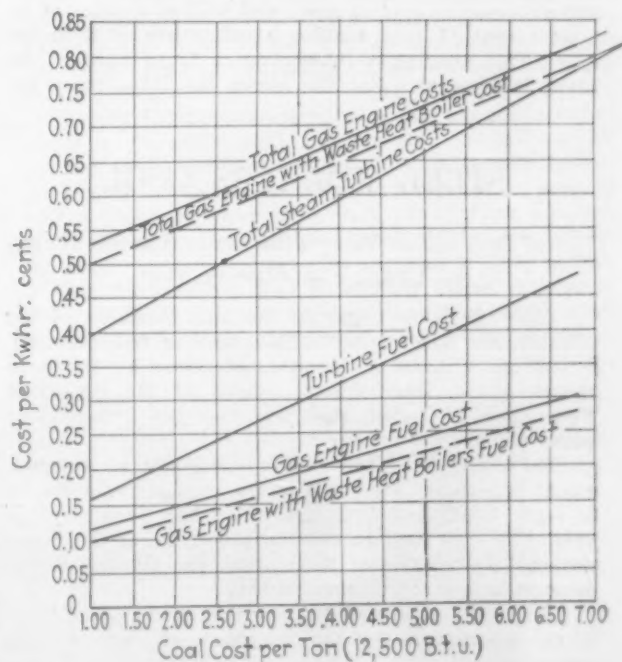


Fig. 3—Unit Cost of Power Based on Cost of Coal per Ton. Showing Both Fuel Cost and Total Cost Under Three Different Plant Conditions

supplied, in addition to the blast furnace gas. Peak load conditions will require around 6000 kw. more for 6 to 7 hr.

The by-products available each day are 4,000,000 cu. ft. coke oven gas, 5000 gallons tar, and 400 tons of small coke. No exact balance between demand and supply of these by-products is possible, however. Figuring a 50 per cent availability of these by-products, and 22,000 B.t.u. per kw-hr. produced, 200,000 kw-hr. could be produced from these by-products.

Deducting the 90,000 kw-hr. required to make up the energy needed in excess of that generated by blast furnace gas, 100,000 kw-hr. of energy could be sold. If 3000 kw. were sold for 21 hr. and an average of 10,000



Table V  
Steam Consumption for the Two Types of Equipment for Power House

1. 2.	Type of Equipment {	6 Gas Fired Boilers, 4 Stoker Fired Boilers		5 Gas and Pulverized Coal Fired Boilers	
		15,000 Pounds	6,000 Pounds	15,000 Pounds	6,000 Pounds
3.	Net station output, kw.....	186,000	138,000	186,000	138,000
4.	Turbo-generators (2) .....	175,000	175,000	175,000	175,000
5.	Turbo-blowers (5) .....				
6.	Circulating pumps serving condensers of generators and blowers.....	18,000	15,900	18,000	15,900
7.	Air and condensate pumps serving condensers for generators and blowers.....	5,100	4,600	5,100	4,600
8.	Excitation .....	1,500	1,200	1,500	1,200
9.	Induced draft fans.....	31,000	26,000	0	0
10.	Forced draft fans.....	1,600	800	0	0
11.	Drying cylinders .....	0	0	200	150
12.	Station lighting, house service pumps, etc.....	800	650	800	650
13.	Pulverizing plant energy.....	0	0	600	450
14.	Total items 3 to 13.....	419,000	364,150	388,000	337,000
15.	Steam supplied other depts. (normal temperature) .....	110,000	110,000	110,000	110,000
16.	Steam supplied by waste heat boilers at open-hearth furnaces .....	60,000	60,000	60,000	60,000
17.	Net outgoing steam.....	50,000	50,000	50,000	50,000
18.	Total items 13 and 16.....	469,000	414,150	438,000	387,000
19.	Boiler blow-off leaks—8 per cent.....	37,520	33,128	35,040	30,960
20.	Sum of items 17 and 18.....	506,520	447,278	473,040	417,960
21.	Boiler feed pumps.....	25,325	23,960	23,650	20,895
22.	Contingencies .....	20,000	19,000	18,000	17,000
23.	Total demand on boilers.....	551,843	490,238	514,691	455,855
24.	B.t.u. in auxiliary exhaust.....	40,700,000	28,400,000	38,000,000	26,400,000
25.	B.t.u. in condensate.....	28,187,500	25,450,000	24,400,000	23,677,000
26.	B.t.u. in make-up (90 deg. evapor.).....	1,947,000	1,490,600	1,330,000	1,180,000
27.	Total items 23 to 25.....	70,834,500	55,340,600	63,730,000	51,257,500
28.	Item 26 ÷ item 22.....	120	115	120	112
29.	Boiler feed temperature.....	210	205	210	201
30.	B.t.u. delivered by boilers, per hour.....	627,447,565	558,872,320	585,205,667	419,674,700
31.	Steam per kw. load (equivalent)*.....	12.5	14.2	11.5	13.15

Boilers 2300 hp. rated capacity.

\*Deducting for steam outgo from station. Equivalent load is taking kw. equivalent of blowing turbo (air hp./1.34 X efficiency of turbine generator and not of turbo blower unit).

kw. for 3 hr. peak load time, the energy can be put out at a cost around  $\frac{1}{2}$  cent, and sold at a price of at least 1 cent, thereby making a net return of \$500 per day. This amount is interest on a large part of the plant investment. For the above the B.t.u. price for

the by-products is figured on a basis of 13,500 B.t.u. coal at \$2.50 per ton. This charges the power plant a price higher per heat unit than they can usually be sold for, as the most profitable method of selling these by-products is in the form of electrical energy.

## STEEL WORKERS COOL

### Union Organizers Meet with Little Success Owing to Change to Shorter Day

That efforts to organize the steel workers of the country are meeting with little success has been admitted by William J. Hannon, secretary of the committee of 14 International unions of the American Federation of Labor that has had the organization plans in charge.

The coolness of the workers and also of International officers is attributed to the change from the 12 to eight hours and 10 hours which has been in progress since Aug. 16. In the official journal of the International Association of Machinists, Mr. Hannon makes some very interesting observations.

"In the 'steel campaign' now being conducted, there is an opportunity for our members who are seeking employment to get positions in the steel mills," says Mr. Hannon. "The 8-hr. day has been inaugurated in some of the mills in some departments, but a large percentage of the men still work 10 and 12 hours.

"But in the steel mills operating on an 8-hr. basis employment therein will be found as desirable as anywhere else. The chief complaint in the past against employment in the steel mills has been the long workday, and while that is still in effect to a great extent, through the proper effort by organized labor every man working in the steel industry can have his hours reduced to eight. Therefore, so far as the machinists are concerned, it will be well for our officers to urge our membership to secure employment, if possible, in the steel mills and there spread the gospel of organization among the workers.

"While the campaign as conducted at present is not meeting with the sensational success we experienced in 1918-1919, it is due entirely to changed condi-

tions. The 8-hr. day and possibly the 10-hr. day, with an increase in wages, has checked the rush for organization that otherwise would have taken place. Therefore the campaign in this direction will be slower until we are able, through other methods we may employ, to interest a sufficient number of men in the movement.

"Indifference on the part of men toward joining the organization, since our movement has created for them a shorter workday, with increased hourly rates, is not confined to the unorganized steel mill workers. Little interest has been manifested by officers and representatives of the several international organizations who should be interested in the success of this campaign. Without the cooperation of salaried officers and members of local lodges in the steel mill districts the work of organization must necessarily be slow. Even with cooperation, the task is not going to be easy."

### Record Portland Cement Output

Production of Portland cement in September is reported by the United States Geological Survey at 13,109,000 bbl.—the highest figure in the history of the industry. This displaces the record made in August of 12,967,000 bbl., which itself had barely exceeded the May record of 12,910,000 bbl. Production for the first nine months is reported at 101,016,000 bbl., which figure exceeds the total for any 12 months except 1920 and 1922.

Shipments fell off from the high record of 14,971,000 bbl. in August to 13,698,000 in September, this figure being slightly below July, 13,712,000, and considerably below May, 14,257,000. Except for the three months mentioned and for July and August of 1922, September shipments were the highest on record. The total for the nine months aggregates 104,607,000 bbl., compared with 88,684,000 bbl. for the nine months last year, which was a record up to that time.



CURRENT BASE PRICES.			
IRON-REFINED	3.55	BANDS	4.35
FENDER	5.15	HOOPS	4.75-5.25
P&O DOUBLE REFD	4.90	STRUCTURALS	3.65
ROUND EDGE	3.75	SWEDISH IRON	7.00
STEEL BARS-SOFT	3.55	U.M. PLATES	3.65
O.H. SPRING	5.05	TANK "	1-4 3.65
ROUND EDGE I.F.	3.75	" "	" "
" " PLN'D	4.55	" " 3-16	3.95
COLD ROLLED STEEL ROUNDS	4.35	AUTO-BODY-PANEL	7.70
SHAPES	4.85	" " FENDER	" "
SHEETS-"ARMCO" BLUE ANND	5.30	PERFORATED SHEETS	
" " BLACK	6.10	12.00-50.00	
" " GALV'D	7.50		
STEEL BLUE ANND	4.25		
" " BLACK	5.15		
" " GALV'D	6.25		
"PENN" MACH'Y STEEL	5.50		
"ELASTUF" SPRING STEEL	7.00		
TOE STEEL	4.80		

A Chart of Current Prices Is Hung In the Office Where It Is Constantly Before Men Who Make Quotations, and May Readily Be Seen by Visitors

## New Steel Warehouse in Philadelphia

Unusual Details of Storage and Handling Among Features of Potts Plant—Large Employee Participation

CONVENIENCE in handling material has been carried to a high point by one of the oldest steel merchants in the country in the design and construction of a new plant. Horace T. Potts & Co., for many years on North Third Street, Philadelphia, has recently moved to its new quarters in the northeast section of the city.

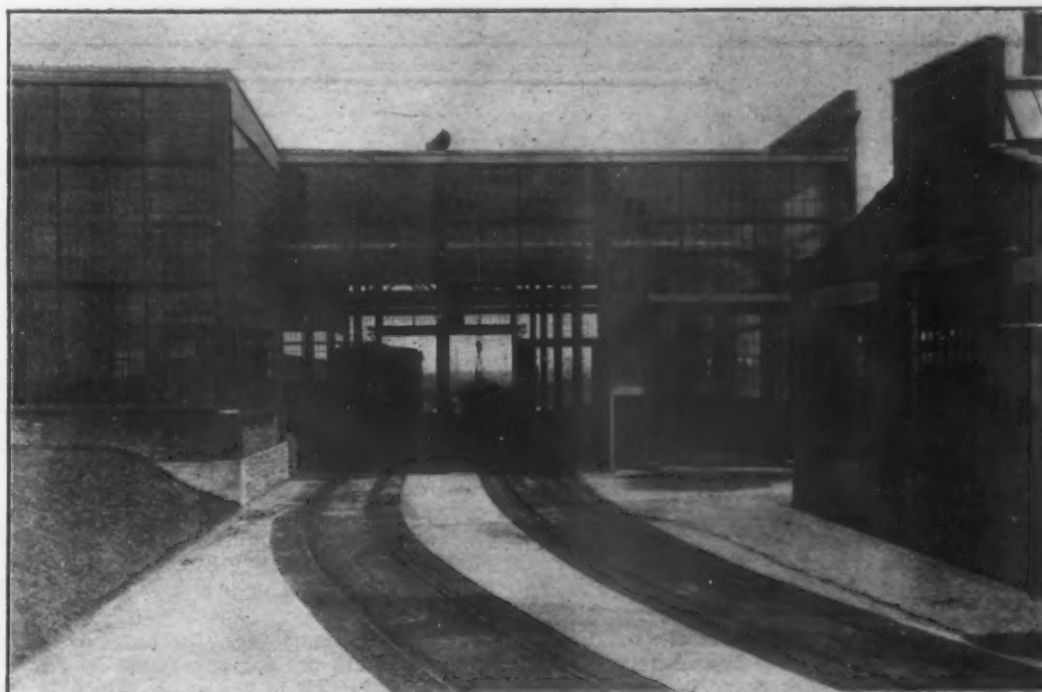
The warehouse is of brick, concrete, metal sash and glass, or what is known as "daylight" construction, covering an area of 225 x 370 ft. Of this space there are five 30-ft. bays totalling 150 x 200 ft. devoted to dry storage. There is a 75 ft. x 370 ft. bay devoted to heavy storage. The building is covered with reinforced gypsum tile which is fireproof, light and not subject to condensation. At the ends of the building are railroad sidings and driveways, as well as a machine shop for repairs of motor trucks, a transformer room and locker-rooms. Attached to the main building is the office building. Adjoining are a garage for storage of company and employees' cars and a residence for the garage foreman who also acts as supervisor of plant watchmen.

Facilities for handling material into and out of the plant have been well thought out and provided. At one end are two railroad tracks side by side from which material coming in may be unloaded to the

platform or floor of the warehouse. On the other side of the tracks is a 25-ft. driveway used when it is desired to load trucks direct from the freight cars. At the other end of the building is a driveway giving to a platform of sufficient length to accommodate ten trucks at once. In this way material coming in does not interfere with that going out, but progresses through the building for storage and to the other end for delivery.

To further the easy handling of material there is a transverse driveway on floor level through the middle of the warehouse. This leads out of the building at one side to driveways which wind around either end of the building and down to the level of the main drives at each end. Electric industrial trucks are used on these drives.

The first impression created is that the whole warehouse is unusually neat and orderly. In the section devoted to dry storage are hot air ducts which deliver dry air to the enclosure to prevent rust. This portion of the warehouse may be entirely cut off from the rest of the plant by electrically operated rolling steel shutter doors. Such doors are also provided at other points, so that the building may be entirely closed in winter. The middle bay in the dry storage section is left clear for through handling of material on a 7½-ton crane.



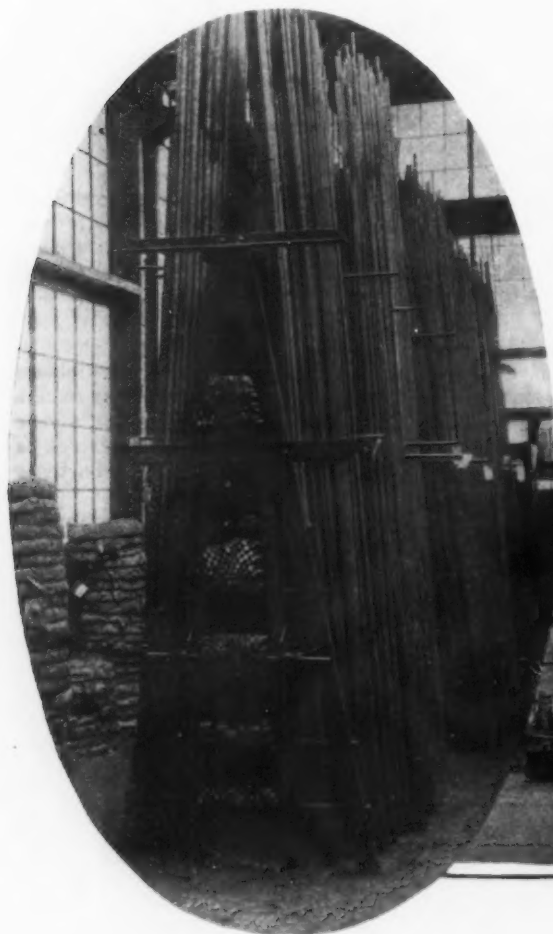
At One End of the "Daylight" Warehouse Are Two Spur Tracks Adjacent to the Unloading Platform. A 25-ft. driveway permits material to be loaded direct from car to truck when desired

To one side of this center bay is the tool and alloy steel storage, the bulk of the company's business being on brands or specification analysis. This material is cared for in two ways, vertical and horizontal storage. The vertical racks are made of triangular supports, so arranged that material is stood on end along the connecting ties. The triangular supports are also provided with cross members which serve to carry bars in horizontal arrangement, thus increasing the capacity of these racks, about one-third over the ordinary use. Another rack in this department is exclusively used for horizontal storage and has 840 compartments. This rack is for stock carried in comparatively small amounts but in great variety of sizes. This part of the dry storage is served by an electric hand crane supplemented by monorail with chain hoists and a jib crane, so located as to properly serve the saws. As the bays are of standard construction, provision is made for a

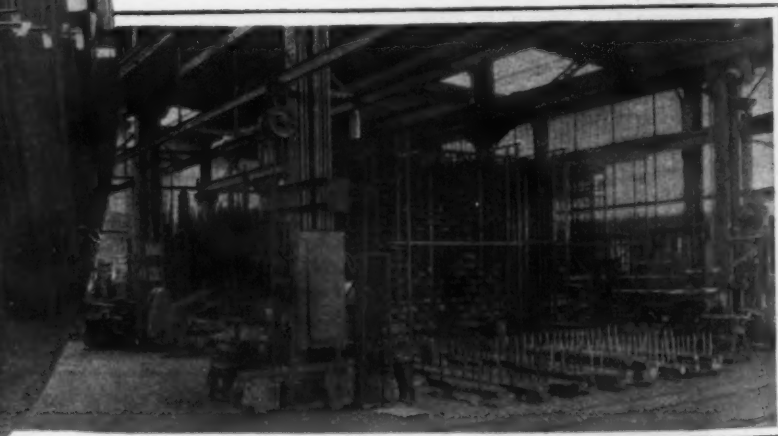
is weighed at once, count being taken of the total of each size of stock in the car. For this purpose there are two 10-ton scales on the unloading platform, each provided with weightograph attachment for quick reading. This avoids dependence on track scale weight which would register shortage on a whole car load, but would not indicate on which particular size in a miscellaneous car the shortage was. The weights of individual classes are checked against invoice weights of each item and proper shortage, if any occurs, may be traced immediately.

It has been found that space may be saved by orderly laying of flat stock, channels, etc. These are arranged in staggered layers, each layer being about 6 in. thick. The ends of alternate layers overhang, permitting a crane sling to be placed under and raise the layer, thereby avoiding the use of space consuming sling clearance strips in the racks used for stacking this class material. The "pigeon-hole" push racks along one side of bay are of heavy enough steel construction to make storage on top available for large rounds or other materials for which there is less frequent demand.

The Potts company is agent for a fencing manufacturer and employs one portion of its machine shop for the manufacture of gates for the fence department.



(In Oval) Vertical Storage Is Combined With Horizontal Push Rack Storage, Thereby Utilizing Space More Fully by Increasing Capacity About One-Third. (Below) Bars carried in small quantity, but great variety, are stored in push racks having 840 pigeonholes. Cold saws, hack saws and band saws are readily served by hand bridge hoist, monorail, and jib crane



power crane if later needed. In this part of the dry storage sheets of odd widths are carried in vertical racks.

The regular sheet storage is on the other side of the center bay. The main floor and a mezzanine, which is 60 x 75 ft. and capable of sustaining 1000 lb. per sq. ft., are used for this purpose. The mezzanine is served by an elevator which also serves the cafeteria on its other end, the floor of which is at the same level as that of the storage gallery. In this portion of the sheet storage material is stacked in horizontal piles. In the sheet department are a set of corrugating rolls and a squaring shear of 1/4-in. capacity both accommodating sheets up to 12 ft. between the housings.

In the 75 ft. bay devoted to heavy storage are two cranes of 7 1/2 tons each, one of 30 ft. span, the other of 45 ft. These cranes operate on parallel runways. To avoid placing a row of columns down the length of the bay thereby cramping handling room, the building was designed with a roof of bridge type construction from which one runway for each crane is suspended. This leaves the entire 75 ft. width clear for handling material.

Incoming material when being unloaded from cars

Several schemes which tend to keep its employees' interest keyed to the highest point have been worked out. In the first place, group insurance is carried. An employee with the company six months secures a policy for \$1,000, which is increased from time to time up to \$3,000 after 15 years. In addition, there are 56 of the employees who have subscribed to the employees' 7 per cent participating preferred stock, \$60,000 having been issued to date. Interest on this stock must be paid out of the company earnings before any distribution to the partners. In the division of company earnings, the capital investment of each partner is credited at 7 per cent, and when any interest bonus on capital is paid to them, the employees' preferred stock receives the same addition. This interest bonus is paid to employees holding preferred stock in addition to the profit sharing which is participated in by all employees.

Of these 56 employees, 30 have been with the company 5 years or longer. Those who are not in position to subscribe to the stock, which is issued in \$100 denominations, may avail themselves of the company's savings account plan, which pays 5 per cent. This is an incentive to build savings to the point



The Delivery Platform Will Accommodate Ten Trucks at Once. Two 7½-ton cranes are mounted with one runway of each supported from the roof structure in the heavy storage bay. Push racks are constructed sufficiently heavy to carry large rounds on top

where shares of stock may be bought. It has been found that the encouragement to employees to become stockholders has caused them to be boosters of the company's business among their friends, thereby adding to the good will and influencing additional business to the company.

#### Crucible Steel Co. of America Makes Favorable Report

The Crucible Steel Co. of America reports net profits of \$5,302,243, after deductions, for the year ended Aug. 31, 1923. After payment of preferred dividends there remained \$6.45 per share on the 550,000 shares of common. This is the most favorable showing since the peak year, 1920. Last year there appeared a deficit of \$3,709,517 before dividends, and a final deficit of

\$6,459,334. On the balance sheet current assets totaled \$29,749,963, against \$28,256,731 in the year previous.

Chairman of directors H. S. Wilkinson in his statement to stockholders said in part:

"We take pleasure in reporting a decided improvement in this year's business over last year. The demand for our products has increased, and notwithstanding the low prices which have prevailed in the steel business during this year, the earnings of your company have increased each quarter.

"The number of customers on our books today is the largest since the company was organized. We are rapidly increasing our production of high grade steel by installing new improvements in our manufacture, which is not only reducing our cost per ton of steel, but is making it possible for us to supply to the trade a larger volume of fine steels than we have been able to produce before."



Each Class and Size of Material from Miscellaneous Cars Is Weighed and Checked Against Invoice Weights, Rather Than to Depend Upon Car Scale Total Weight. Flats, channels, etc., are stacked in staggered layers to avoid need for strips, to permit sling clearance. Suspended crane runways with two cranes show clearly in this illustration



# Forge Shop with Charger-Manipulator

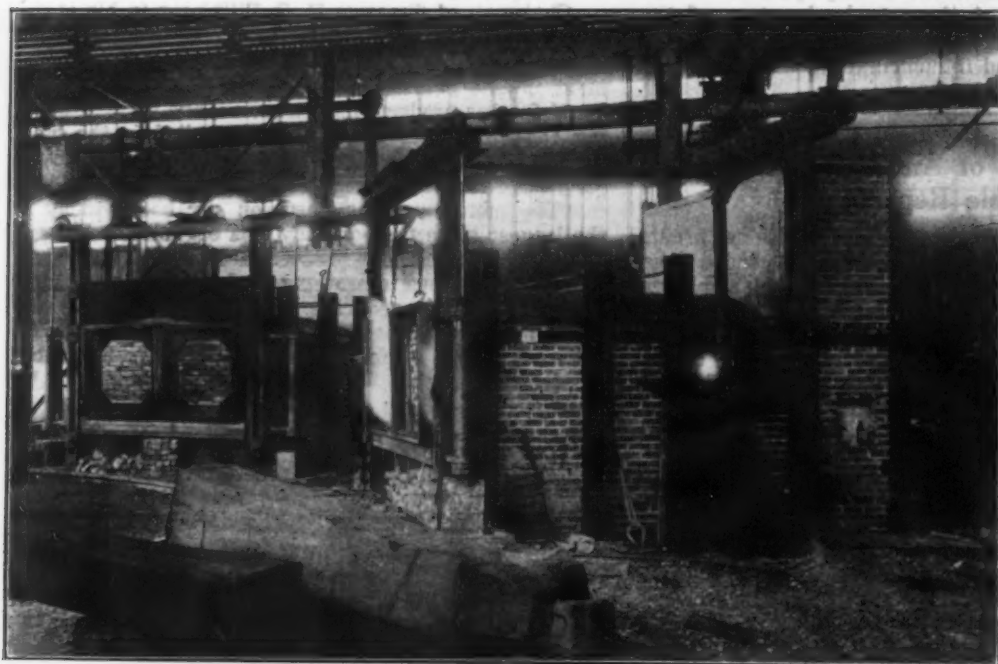
Machine Operates on Turntable, with Heating Furnaces  
Grouped Radially About It—Flexible Heat-  
Treating Furnace a Feature

WITH the completion of the reconstruction program of the Union Electric Steel Corporation, Pittsburgh has added another quality steel-making unit. This company is now an interest of the Edmund W. Mudge Co., Pittsburgh; through liberal expenditures during the past year there has been created a modern, efficient and economical plant.

New equipment has been installed, consisting of a new heat-treating department, a combination manipulator and charger of special design, a new power plant, new forging furnaces and numerous additions to the machine shop equipment. Little of the former equipment, except the 1000-ton forging press, the 5000-lb. hammer, two smaller hammers and the two Heroult electric furnaces, has been retained, and the management believes that the plant now is the equal of any in the country, for the production of electric steel.

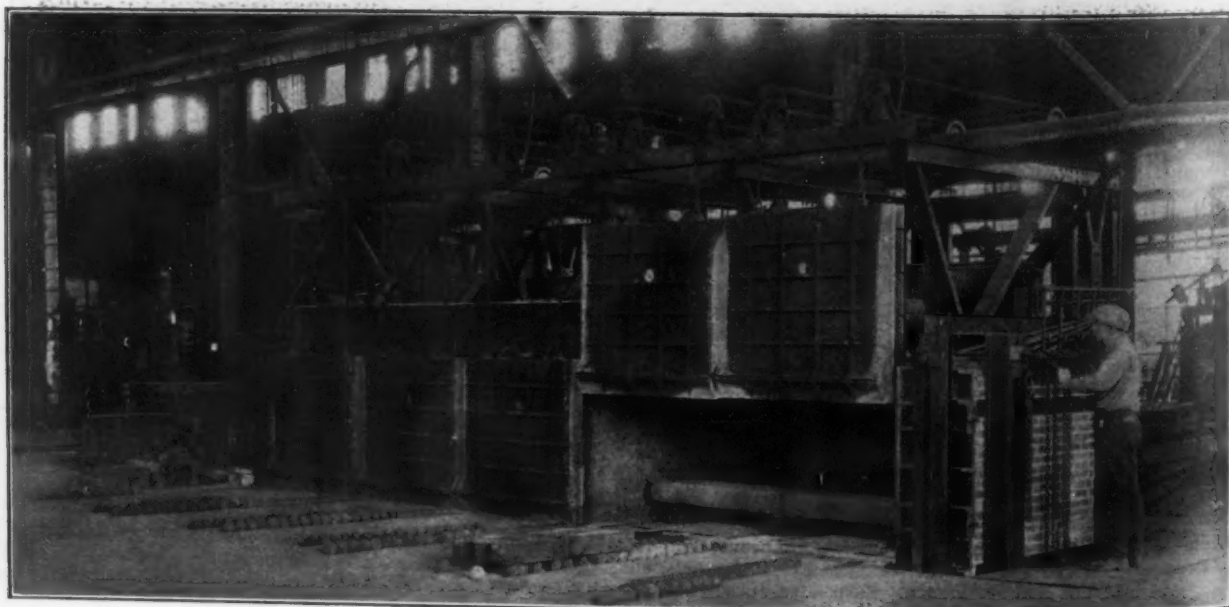
It was proved at the United States Naval Ordnance plant at South Charleston, W. Va., that electric steel is superior to other steels in giving the proper transverse, as well as longitudinal, tests in gun forgings, the physical properties of which are similar to those required of steel used in the manufacture of die blocks, except for the greater hardness of the latter. It was, therefore, decided here that all steel used in the manufacture of die blocks, trimmer steel, shoes, rams, piston rods, as well as other supplies for the drop forge industry, should be electrically melted. The equipment for this at present consists of two 6-ton Heroult furnaces, each capable of producing 24 tons of steel daily.

It is the practice of the new management to keep the carbon within a 5-point range, the manganese within a 10-point range and alloys within similar limitations, while sulphur and phosphorus are kept



At Left — Forge Furnaces in which the Air Is Heated in the Rear and Conveyed to the Heating Chamber Through Calorized Pipes, Protected from the Furnace Flame by a Baffle Wall

Below—Heat-Treating Furnace; This Furnace Can Be Employed as a Single Unit or as Five Separate Units, by the Use of Sliding Partitions





Charger Holding Ingot in Forging Press: Operator Using Optical Pyrometer. As the charging machine virtually rotates about a central point, just as a locomotive turn-table rotates, by running on wheels on a circular track, it can handle ingots or billets into and out of furnaces arranged radially about that center. Cold ingots are deposited within its reach by the overhead electric traveling crane

under 0.02 per cent. As an extra check, each heat is examined microscopically before forging, to insure a clean steel in the finished product. As an additional safeguard to quality, the temperatures during heating are controlled pyrometrically within narrow limits and an accurate reading of the temperatures of all ingots during forging is made and recorded. Hardness tests are made and recorded on all blocks and each piston rod is tested physically as to tensile strength, elastic limits, elongation and reduction before shipment.

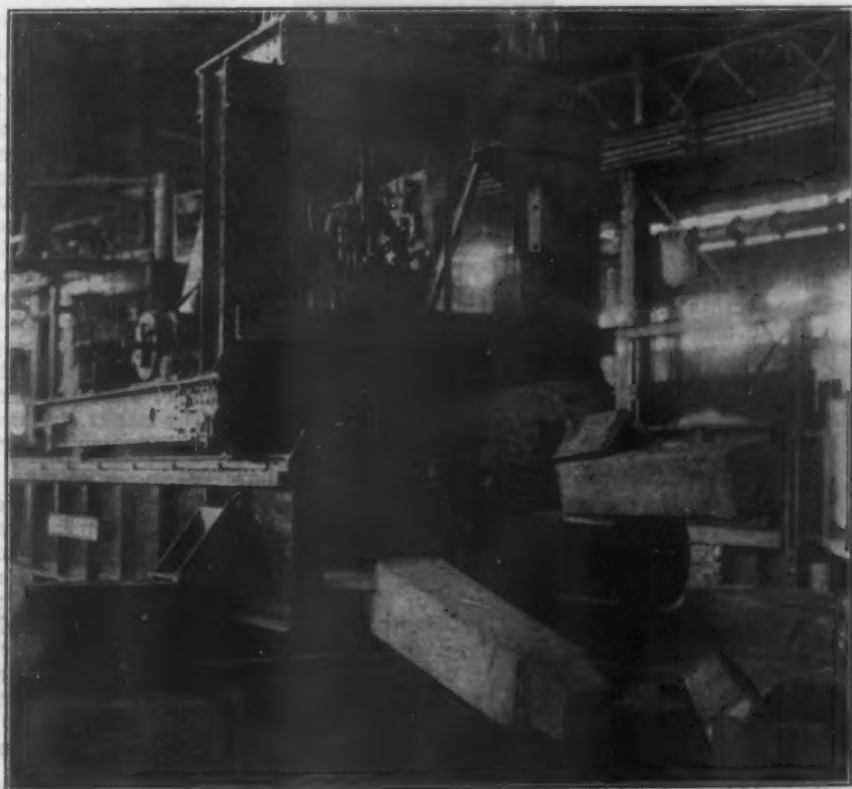
Grouped radially around the revolving manipulator, the forging furnaces are oil-fired and of special design, in which the air is preheated in the rear of the furnace and conveyed through a series of calorized pipes to the

burners. The doors are operated by hydraulic cylinders.

The manipulator or charger, designed and built by the Alliance Machine Co. from specifications submitted by this corporation, not only fits the requirements perfectly, but promises to pay for itself within a short time, since, in the physical handling of material during heating and forging, the number of men and the time required for each operation have been materially reduced.

Operation of this machine is extremely interesting, as it revolves around a center table on a 34-ft. diameter circular track. Like the open-hearth charging machine, it is controlled and operated by one man. Ingots are placed within reach of the manipulator by

Charger With Ingot Ready for the Forge or Preheating Furnace. This machine not only rotates on its circular track, as on a vertical axis, but has a considerable in-and-out motion on rails on the lower girders, just as an open-hearth charging machine operates. In addition, and again like the open-hearth unit, the "peel" has its own rotary motion about a horizontal axis, thus turning the piece to any desired angle under the forge



electric cranes, after which all charging and discharging of furnaces and manipulation under the press are taken care of by this machine. The forging operation is now the work of but two men, the press and manipulator operators with a third man to hold the cutting tool below the ram of the press, in case the ingot is to be cut into die blocks.

The recuperative heat-treating unit, built by the W. S. Rockwell Co., New York, is a ball-operated type, under-fired oil furnace, a feature of which is its flexibility. With its five doors, it may be used as a single unit or as two, three, four or five separate compart-

ments, made by the adjustment of steel-bound "silocel" partitions. Its construction is such that additions can be made to either end at any time. Temperatures are controlled by a Leeds & Northrup recording pyrometer system.

Plans of the corporation call for the building of additional forge furnaces placed radially around the manipulator, and as increase in business warrants, a second manipulator with its complement of forging furnaces and equipment will be installed, at which time additional heat-treating units and another electric furnace will be necessary.

### Acme Spot Welding Machine

The Acme Electric Welder Co., Los Angeles, Cal., is introducing in the East an improved type of its electric spot welding machine. The welders have the transformer located close to the rear end of the horns thus to minimize loss of current and give high efficiency. They are made in two styles, one having stationary and the other adjustable, lower horns. Sizes range from 13 kw. to 15 kw. and from 12 to 30 in. throat and they operate on 220 alternating current but may be wound for other current.

The horns are made of cold drawn copper and of



The Transformer Is Located Close to the Rear End of the Horn, an Arrangement Intended to Minimize Loss of Current

2-in. diameter, which has proved to be ample to eliminate overheating of the electrodes. The horns are reversible and any length horn can be used in either machine. The lower horn can be dropped or moved to either side by adjusting one bolt. The machine is provided with a socket wrench which fits all the adjustments.

When lower horn is dropped it is very easy to weld in the bottom of steel boxes, tanks, cabinets and similar pieces. The electrodes can be adjusted to any desired angle which gives the operator a chance to get into corners of difficult places. The upper electrode comes in contact with the work under spring pressure and two springs are provided for heavy or light material. The voltage regulator control switch has eight steps to suit different thicknesses of material, which may range from No. 30 gage to  $\frac{1}{2}$  in. wire.

The upper horn is carried by a rocker arm which is brought into contact with the work by pressing the foot pedal. This presses together the parts to be welded and by further pressure the current is applied until the weld is made, at the same time holding the pressure

long enough to let the weld cool, an important feature in spot welding. Working parts are inclosed in a cast iron casing which saves operator from coming in contact with live wires.

Distributors of the welder have been established in the Bourse Building, Philadelphia, and at 536 West Twenty-fifth Street, Chicago, where the machines are carried in stock.

### Car Building in the South

BIRMINGHAM, ALA., Oct. 15.—The Chickasaw Shipbuilding & Car Co., subsidiary of the Tennessee Coal, Iron & Railroad Co., has completed about one-fourth of an order for 1000 ventilated box-cars for the Louisville & Nashville Railroad Co. High officials of the road, including the chairman of the executive board, Henry Walters, W. L. Mapother, president; George Evans, vice-president in charge of operations, and several directors and others, recently visited the plant and saw the actual manufacture of the cars.

The Virginia Bridge & Iron Co. is turning out some cars for the Central of Georgia Railroad.

The shed and other portions of the Gadsden Car Works, subsidiary of the Southern Railway, destroyed by fire at Gadsden, the past week, are being rebuilt. Sixty-six finished box cars were destroyed in the fire which was of undetermined origin. The loss was \$250,000.

Specifications are in sight for a number of new cars and expectation is that much work of this kind will be placed in this district.

### Transmission of Heat Through Steel Pipes

In a study of transmission of heat through steel pipes, being conducted at the Pittsburgh and Minneapolis stations of the Bureau of Mines, Department of the Interior, work on several sizes of steel pipes, calorized and plain, has been completed. Further tests will cover 2, 4 and 6-in. pipes. Air velocities and temperatures in the heating chambers, as well as the size of pipes, are being varied over appropriate ranges. Temperatures are being measured in the center of the pipes and in the heating chamber one and two inches from the outside wall. It has been found that steel pipes offer a higher resistance to the transmission of heat after calorizing than before. Under the conditions of the test but slight effect was noticed on the calorized pipe, while the plain steel pipe oxidized quite readily. The results obtained furnish a basis for the design and construction of preheaters.

James J. Weiler & Sons Structural Steel, Ornamental Iron & Metal Products Co., established at Huntington, W. Va., since 1916, will build a fabricating plant at Second Avenue and Elm Street, that city. Hitherto fabricating was done in Pittsburgh and Cincinnati, the company maintaining a warehouse and taking offices in the Robson-Prichard Building. Four buildings will be erected on the newly acquired property, one a steel frame structure with concrete block construction will measure 200 x 300 ft., and will be equipped with steel sash. A crane runway will traverse the entire length. Construction work will start within 30 days, providing plans are carried out.



# Treatment of the Modern Industrial Gear

## Advantages of Helical Gear of Low Helix Angle—Quick Quenching of Low-Carbon Gears Gives Great Toughness and High Surface Hardness

BY W. H. PHILLIPS AND L. F. BURNHAM\*

**P**OWER must be transmitted by gearing continuously, with a degree of reliability that insures the uninterrupted operation of the particular equipment. The seriousness of vibration, whether of great or small amplitude, has always been recognized and, to no small degree, vibration may be traced to the gear. The bearings that wear out too quickly, the shafts and pedestals that get out of alinement, the machine parts that become fatigued and fail, the motors that wear out commutators and brushes too quickly, and the armature leads that break—all these may be traced, in part at least, to vibration. Any formula figuring depreciation of equipment must be multiplied by a constant representing vibration.

Increasing the life of a hard-worked gear means far more than the saving in initial investments, which may be trivial. Tripling the life of the gear cuts the cost of the gear to one-third, but it also does away with removing two worn-out gears and installing two new gears. It eliminates the necessity of having the particular equipment shut down, possibly for hours, with its effect upon still other equipment dependent upon the first. These shut-downs often entail enormous loss of production. These far-reaching delays are serious and, in the interest of lower costs, must be avoided.

Permissible reduction in sizes due to improved material, heat treatment and greater tooth strength through design offers new possibilities in effecting substantial savings in material and space. This, together with higher efficiency through better tooth forms and greater accuracy in manufacture, affects power consumption and, while this effect may be small, it is continuous.

### Design

There is little strictly new today in gear mathematics. The writers are in possession of portions of Willis' "Principles of Mechanism," 1841; also edition of 1870. Willis mentions practically all the properties of gearing as now understood, with references to early writers, as far back as 1615. It is fair to say the history of modern gearing starts contemporaneously with the mechanical revolution of the last two centuries or earlier. However, accurate gearing had to await the development of the modern machine tool, for gearing is no better than the means to produce it.†

Most early gears were cast, instead of machined, using the cycloidal tooth form. Cast gears still survive for rough service in mills, etc., but are found less and less frequently, as the modern, heat treated, cut gear gives superior action and life. Very recently, with the development of die casting, a die-cast gear for small powers has been brought out but has not received wide approval, as it is made of non-ferrous alloys. Today, for uniform power transmission, the cut steel involute gear is predominant.

There are many curves which could be used for gear tooth contours, but of these the involute is the most valuable. It permits alteration of center distance without effect on uniform velocity ratio, it is easily cut by the generating process and its mathematical properties are susceptible to exact study for the purpose of designing gearing according to any desired specifica-

tions. The cycloidal system is lacking to some extent in the properties mentioned, and is seldom, if ever, found except in a cast or rotary cut gear.

The first street railway helical gear set ran 500,000 car miles, is less than one-fourth worn, is still running, and has at least doubled car mileage on the pinion. Just as it is difficult to visualize the advantages of the long and short addendum, so with the helical gear. Apparently, however, the helix permits a minute section of tooth face and a correspondingly minute load to enter engagement, the load picking up as the face in mesh widens out, thus preventing tooth deflection.

The superiority of this gear was first thoroughly proved in railway service and for the last few years this type has been placed in all sorts of industrial service. The end thrust varies from 10 to 13 per cent. Where this is too great, a smaller helix angle is selected. There should be some provision for end thrust; usually this is found in collars already on shafting or in the resistance of the rotor to leaving its magnetic center. When the helical gear was developed, the fea-

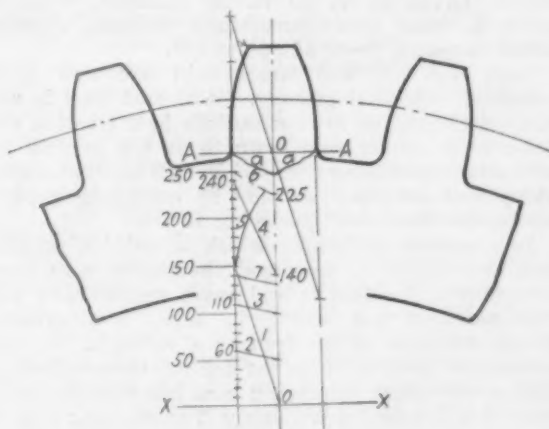


Fig. 1—Tooth Loading for Various Steels

tures of long and short addendum gearing, high pressure angle, and a certain percentage of stubbing were incorporated in the tooth to give it the advantage of these desirable qualities.

### Material and Heat Treatment

As the tooth is loaded as a cantilever beam, the grain structure in the raw material should be radial if possible, to give the tooth the benefit of the full strength of the steel. This is being accomplished to some extent in the upset hammer-forged pinion, and to a greater degree in the drop forging. The forged and rolled steel gear blank is also produced with this radial grain. When castings are used, especially when they are heat treated, clean steel is necessary, particularly at vital sections. With heavy masses tied together with thin sections, a surprisingly small flaw will cause failure of the piece in heat treatment.

Referring to Fig. 1, it can be seen that the tooth is joined to the heavier mass representing the body of the gear across section AA. Any structural changes involving heavy internal stresses at this point will impair seriously the strength of the tooth, which is stressed most heavily across this section in performing its work. This condition has eliminated alloy steels

\*Manager, engineering department, and mechanical engineer, respectively, R. D. Nuttall Co., Pittsburgh. This is a portion of a paper read before the Engineers' Society of Western Pennsylvania.

†Watt and Boulton were in high glee when they reached the point of getting a cylinder within  $\frac{1}{8}$  inch of "round."—EDITOR.

in heavy gearing, since they fail through fatigue indicated by *aa*.

Both by estimation and failure of steels in certain services curve 3 has been established as the stress curve on a certain gear, the maximum stress occurring at *C*, dropping to *O* at the neutral axis and going into maximum compression at *C'*. Curve 1 is an untreated steel in this service, failing almost immediately through fatigue, the surface and the material to a considerable depth being stressed beyond the ability of the steel to carry the load. Curve 2 is a 0.40 to 0.50 per cent carbon, oil-treated steel, failing almost as rapidly as curve 1. Curve 3 is a 0.55 to 0.65 per cent carbon, oil-treated steel, failing in the same way but much more slowly.

Curve 4 is the ideal steel to resist just such a load as shown by curve 3. Its strength is proportional to the load it has to carry. The grading off in strength and hardness reduces the heavy initial stress that must be set up when a steel is hardened uniformly throughout. Its maximum strength is ample to carry the peak-load. Curve 6 is an alloy steel showing but a slight drop in hardness and strength through the section. While the apparent strength should provide ample margin over the tooth loading, the initial stress in the steel drops the effective strength below curve 3 at the surface, thus starting fatigue which progresses rapidly. The dotted curve shows the difference between actual strength and internal stresses.

An effort is being made to duplicate curve 4 with an alloy steel by selecting an analysis that drops the carbon with respect to the eutectoid point in proportion to the carbon steel of curve 4. Any curve crossing curve 5 represents a steel that has fallen below the actual tooth stress required in this application. This form of heat treatment, which grades the structural change, permits the successful handling of large masses. Gears up to 10 ft. in diameter, weighing 14,000 lb., have been successfully treated, showing Brinell hardness limits of 364 to 477.

Both cast steel and forged steel are now being treated in industrial gearing. Most cast steel is acid open-hearth, and we are successfully heat treating acid open-hearth carbon steel down to as low as 0.28 per cent carbon, producing over 400 Brinell hardness, without causing excessive warping by quenching rapidly. Briefly, the theory of quenching is this:

In a casting or forging which is called a pearlitic steel, the carbon is combined chemically with three parts of iron (cementite) and again mechanically with seven parts of iron which, in turn, is distributed through the rest of the iron as a network. In heat treating we heat it up to the critical temperature, at which temperature the carbon goes into solution in the iron. If it is cooled down slowly it comes back into the pearlitic state.

If we cool it fast enough we can hold the carbon in solution in the iron, getting a solution of carbon and iron. We can cool a 300-lb. gear of 1 per cent carbon steel in oil in 8 minutes and get 500 Brinell hardness. At that point wear is eliminated as a serious factor. This is practically a tool steel. If we cut down that carbon content, still maintaining the hardness, we get a solid solution of iron and carbon with smaller percentages of carbon in the solution, giving a tougher steel. To harden this steel, however, we have to increase the speed of quenching; and we have succeeded in cooling these 300-lb. gears in water in 3 minutes. We have gone still further and quenched in a special solution in 1½ minutes and, on account of that very drastic quenching, can drop our carbon content to as low as 0.28 per cent.

This, we have found, is the most successful heat treatment for most classes of industrial gearing, giving a very tough gear, with a low carbon content and a high surface hardness. Its resistance to fracture under impact is enormous and its hardness is still sufficient to maintain a low percentage of wear. In fact, it quadruples the life of the untreated gearing; on a casting it will increase the life 3½ times. These figures are pretty well established through years of following up the heat-treated gear in service.

One of the difficulties in heat treating industrial gears is that many gears were designed merely to carry

the load, without regard to how the light and heavy sections are blended and what the stiffness of the gear is. As a result, when some of these designs are put through the quenching operation, we get distortion or set up enormous strains.

Properly designed gears up to 10 ft. in diameter, and weighing up to 5 tons, can now be readily heat treated. This is our maximum capacity at present, but we are contemplating treating them up to 15 ft. in diameter. The saving is obvious, especially where the gear is subjected to severe service. Considering the importance of keeping the equipment running, when a shut-down would mean serious loss of production, the slight increase in cost over the untreated gear pays for itself many times over.

### Inspection

The gearing itself must be inspected when cut. Different types of gears demand different types of inspection. First as to accuracy of tooth contour, this may be established by special involute contour instruments. They work on the principles of involute tooth generation. To measure pitch displacement, the method for machine measurement of the table worm wheel can be utilized. There is also a tool which measures from tooth to tooth, measuring by the involute curve properties.

The final inspection of gears is as follows:

*Spur gears* are checked for tooth thickness and addendum by use of tooth verniers or gages, on small jobs. On quantity jobs, the gears are run on fixed centers. Special test machines are used, together with an indicator to check eccentricity, thin and heavy teeth, errors of indexing, interference, bearing alignment, runout, etc.

*Bevel gears* are checked in a similar manner for tooth dimensions. They are checked on a surface plate for shaft angles. The center distance from the backing of the bevel gear on a surface plate to the center of bore of the pinion in mesh therewith is checked. This is important and should be insisted on by prospective customers. While still set up, the face alignment is checked.

*Helical and herringbone gears* are checked in a similar manner to spurs. The pinion face is left long in herringbones to take care of pitch displacement errors and when aligned up the extra face is removed.

*Worms and worm wheels* have teeth and threads checked for dimensions similar to spurs. The worm is seated on the wheel and checked for center distance, misalignment, angle of the meshing teeth, lead of the worm, and central position of the worm on the worm wheel. Where the quantity justifies it, this is done on centers.

### Installation and Maintenance

A gear is designed to have the entire width of face carrying the load. Misaligned or inadequate bearings tend to localize loading and, while the gear quickly adjusts its face by rapid wear to take care of these conditions, fatigue may have been started which will ultimately cause failure.

Any tendency to wear ridges on gear teeth should be eliminated, since riding on this ridge of the meshing member causes heavy localized loading. It is essential to maintain proper depth of meshing. Meshing too close on centers causes wedging of the teeth, resulting in enormous loading.

When flywheels are part of the equipment, the overload stress to buck the motor is tremendous. When flexible couplings are installed on both sides of the gear reduction, they relieve the gearing, but often to their own detriment.

Proper lubrication is good economy and it pays to watch the accumulation of dirt and grit in the gearcase and clean the case periodically. In street-car service, as high as 35 per cent of grit has been found in a supposedly well lubricated gearcase.

Sixteen old passenger cars at different points in Texas are offered for sale by the International-Great Northern Railroad Co., C. B. Porter, Houston, Tex., purchasing agent.



# Labor Unions in the Field of Banking

## Probable Effect of New Movement on Strikes—Report to Portland Convention Discusses Possible Influence Through Banks and Insurance Companies

BY L. W. MOFFETT

WASHINGTON, Oct. 16.—Labor has definitely entered the field of finance and much greater ownership of industries. In other words, labor is stepping in the shoes of capital. The length to which it has moved in this direction probably is not realized generally in either the financial, commercial or industrial world. The trend is looked upon as being especially significant as it concerns the status of labor and capital, and, in fact, is making the words almost synonymous. Organized labor has used restrictive measures and the strike to obtain better wages and working conditions, but under new conditions, provided the present movement grows, as apparently it will, it is suggested that the strike and restrictive measures may be abandoned to a large extent.

It appears, evident that labor is striving for control of credit and, if successful, it is maintained, will be in a powerful position to exact its demands. On the other hand, the contention is made that, with labor accumulating credit and ownership in industries, it will find its interests closely paralleling those of officials and heavy stockholders of financial and industrial institutions and even will find its membership advancing to official positions in these institutions. In such cases, it would be expected that the strike would be progressively laid aside as a weapon for frequent use. The effectiveness of unionized labor which relies so largely on this weapon manifestly would be greatly reduced, should this eventuate.

This movement of labor that has taken on such a strong impetus has been given considerable study by Richard Boeckel, Washington, a labor economist, who at one time was expert for the Industrial Board set up during the war by former Secretary of Commerce Redfield.

### Labor Banks Established

In its annual report to the Portland convention of the American Federation of Labor, the Executive Council of the Federation stated that there are now "practically 23 labor banks either doing business or about ready for business. In addition about 20 more such banks are now in process of organization," said Mr. Boeckel.

The actual number of labor banks in operation at this time is 15. The fifteenth was opened at Cincinnati Oct. 6 by the Brotherhood of Railway Clerks. Twenty banks probably will be in operation before the end of the present year and 50 by the end of 1924. The present resources of these banks exceed \$50,000,000.

This movement, which has shown such a remarkable development during the last three years, in spite of the hostility of some "two-fisted, fighting leaders" of organized labor, calls for attention and close study on the part of intelligent American employers, in the opinion of Mr. Boeckel. This is not a movement that has developed out of theory and on the basis of propaganda, he contends, but it is a development out of the conditions that have confronted the workers and brings with it the promise of a complete revolution in trade union methods.

### Financial Cooperation

Through its new banks, and the investment and insurance companies by which they are to be flanked, organized labor is for the first time inviting real cooperation—financial cooperation—with it by the general public. It is inviting the cooperation also of intelligent and liberal employers, in an effort ultimately,

as Mr. Boeckel believes, to bring about a real "industrial democracy" in the United States.

### An Important Power

A resolution introduced at the Portland convention of the American Federation of Labor proposed to give the official endorsement of the federation to the labor banking movement and urged all trade unionists to deposit their funds in labor banks. Should trade unionists generally shift their deposits to the new workers' banking institutions, organized labor would immediately become an important financial power. It behooves intelligent employers, therefore, to learn how the present financial power of the new capitalistic institutions of the workers is being used, Mr. Boeckel urges, and how their increased power is likely to be used in the future.

"For anyone who has studied the new labor banking movement—the 'new radicalism' in the United States—the conclusion is inescapable that its principles are in direct conflict with much of the philosophy of the old trade unionism," said Mr. Boeckel. "This fact is recognized abroad, for a recent article in the London *Socialist Review* urged that many of the old trade union methods be abandoned and that a 'capital conscious movement' be inaugurated in Great Britain. 'America,' the article concluded, 'has shown the way.'

"The example being set by American workers is bound to exert a profound influence upon the labor movement throughout the world. Even in Germany, where conditions are far from propitious, a large trade union bank is at present in process of organization. And Germany has something to give American workers by way of a return example.

"The National Union of Metal Workers (Metallarbeiterverband) one of the largest European trade unions, has recently established a Research Department which collects statistics upon the financial condition and the profits of all industrial enterprises in which German metal workers are employed. These statistics are furnished in detail to the works councils in the various metallurgical establishments, and the wage and other demands of the workers are largely based upon them. When such methods as these begin to be adopted, and the workers are found to be in control of a substantial part of the credit without which industry cannot function, the time when industry must of necessity be transferred to a cooperative basis is not far distant.

### Putting on Business Basis

"How rapidly American trade unions are being put upon a real business basis, under the influence of the new labor banks, is indicated by what is happening in the bookkeeping departments of many unions. Heretofore, many of the 'fighting' leaders of labor have been intolerant of any system of accurate accounts. Not a few unions have kept their funds, sometimes amounting to hundreds of thousands of dollars, in the names of individual officers. Embarrassment to the unions because of the carelessness or the dishonesty of these individuals has often been the result.

"The new labor bankers are quietly asking questions about trade union balance sheets, vouchers and other matters in which they as bankers are interested. Approved business methods in the business management of the unions have been coming into wider use

(Concluded on page 1092)



# Commercial Alloys of Chromium and Iron\*

## The 20 Per Cent and Higher Chromium Mixtures in Different Carbon Ranges—Physical Properties, Heat Treatment and Structure

BY C. E. MAC QUIGG

CHROMIUM has well-defined effects when added to the iron-carbon system. These effects depend on the amount of chromium added and on the composition of the iron-carbon alloy to which the addition is made, i.e., whether low or high-carbon steel, cast iron, etc. In the case of the low-carbon steels, the chromium addition, when not in excess of several per cent, appears to exert an influence on the properties by its influence on the critical range. In the higher chromium alloys, the physical properties are influenced chiefly by the formation of new complexes, such as iron-chromium solid solutions and, with higher carbon contents, iron chromium carbides of great hardness.

Examination of the published data on the critical range phenomena of chromium bearing steels up to several per cent chromium indicates an agreement on the following points:

1. Alloys of iron and chromium without carbon have their magnetic change point  $A_2$  depressed, the depression being function of the chromium content. The elements iron and chromium form an unbroken series of solid solutions and the lag between  $A_r$  and  $A_c$  is quite small, and the position of neither is much affected by previous heat treatments.

2. Chromium raises the thermal critical range, the elevation of the range being a direct function of the amount of chromium present and the amount of carbon contained in the alloy.

The outstanding effects on steel of chromium additions up to several per cent are the development of hardness without brittleness in the treated specimens, a finer grain, and the lessening of the mass effect in heat treatment. The effect of lowering the carbide change, by even moderately slow rates of cooling, is to cause the chromium steels to assume desirable physical properties with treatments much less drastic than are required for plain carbon steels of like carbon content. This results from the suppression of the critical range by under cooling.

Until recently there has been a gap in the plain chromium steels (from about 1.5 per cent chromium to the stainless-steel range). Some excellent steels have been described by Aitchison and unusually good properties obtained with 2.5 to 3 per cent. chromium.

The combination of hardness, tensile strength, and toughness suggests the use of such compositions for rails. It has been found that the air-hardening properties of chromium give a refinement of grain, even with large masses air cooled; this might be expected to improve greatly the structure at the center of rail head over that common to plain carbon-steel rails.

Chromium as an alloying metal in high-speed steels has long been indispensable, many standard brands containing it in quantities up to 4.5 per cent. Satisfactory tools have been made with about 18 per cent chromium and no other alloying elements but vanadium. There has been much controversy as to whether tungsten or chromium is chiefly responsible for the self-hardening properties of high-speed steels.

With the exception of the plain nickel steels, most of the well-known engineering steels are alloys containing chromium and one or more alloying elements in addition to the carbon, such as nickel, vanadium, molybdenum, etc. Their properties are fully described in several standard references.

The place of so-called "stainless steel" in cutlery has become well established. The composition is generally

12 to 13.5 per cent chromium with 0.3 to 0.4 per cent carbon. Since the development of the stainless steels, stainless or rustless irons have been experimented with. With from 9 or 10 per cent up to 14 or 15 per cent chromium and less than 0.10 per cent carbon, this class of alloys does not require heat treatment to develop stainless qualities.

Alloys with 12 or 15 per cent or more chromium and the balance iron or one or more elements, as nickel, cobalt, tungsten, molybdenum, etc., have been brought to a quite useful stage of development in a number of compositions. Many of these have received well-known trade names in this country and have been extensively used for electrical resistance, high-temperature resistance, tools, etc. Examples that may be cited are Nichrome, Rezistal, and Stellite.

### Alloys with 20 Per Cent or More Chromium

Although this investigation has extended over a number of years, some points are still of a controversial nature because of a lack of knowledge of the behavior of metals and alloys in general from the standpoint of physical chemistry. The information is therefore presented largely from the standpoint of engineering interest.

It may be well to picture alloys between 20 and 30 per cent chromium as having, in a general way, similarities to the plain carbon steel-iron series. The alloys low in carbon resemble steels in being forgeable; they gradually shade over into the white-iron or chilled-iron alloys in the high-carbon range. While the similarity is somewhat distorted, the two series are in many qualities comparable. No graphite will be found, however, in the iron-carbon-chromium series of this range. For convenience in discussion, the alloys may be divided into three purely arbitrary groups, according to carbon content: Low-carbon, up to about 0.5 per cent; medium-carbon, 0.5 to 1.5 or 2 per cent; high-carbon, 2 per cent and more.

**Chemical Characteristics:** The outstanding chemical property is resistance to oxidation at high temperatures, or in fact to any oxidizing action. Exposure to air at 1000 deg. C. will cause, on bright samples, a light tarnish, or at most a thin and toughly adherent scale that acts as a protective coating that arrests or prevents further attack. The mechanism of oxidation has been discussed elsewhere on the basis of the quality of the oxide formed and, as has been pointed out by Bancroft, the property of non-corrodibility is a function of the quality of the scale or product formed. It has been noted in tests that the maximum amount of scale is formed early and that indefinite exposure does not seem to increase materially the percentage of scale in many cases.

Carbon content does not seem to influence the resistance to oxidation. On the other hand, increase of chromium from 16 to 18 up to about 20 or 22 per cent increases the oxidation resistance to an appreciable extent. Above about 22 per cent, the relative improvement in oxidation resistance with increase in chromium is not so marked. This effect is believed to be due to the tendency to form a tougher and more adherent scale if alloys are above 20 per cent chromium than if they are below 20 per cent.

All of the alloys are remarkably resistant to nitric acid in all concentrations and temperatures. They are not resistant to hydrochloric acid and are not recommended for resistance to sulphuric acid, more particularly at temperatures much higher than 50 deg. C.

**Electrical Properties:** The specific electrical resist-

\*From a paper presented at the August meeting of the American Institute of Mining and Metallurgical Engineers at Montreal, Aug. 30. The author is metallurgist with the Union Carbide & Carbon Co., Research Laboratories, Long Island City, N. Y.

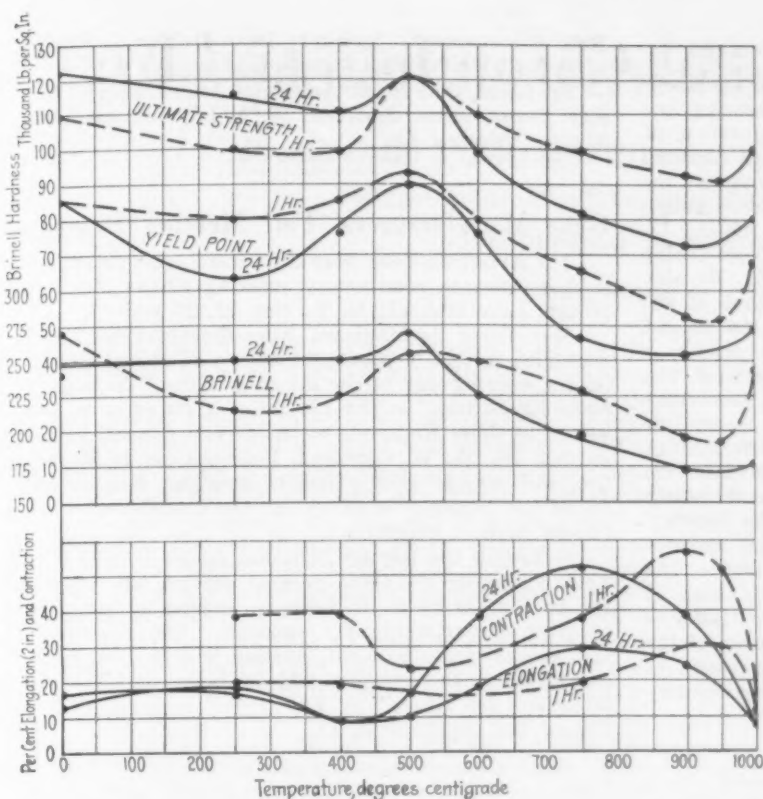


Fig. 11—Strength and Ductility of Low-Carbon Chrome-Iron Alloy; Specimens Air Cooled After 1 and 24 Hr. at Temperatures Indicated

ance of the alloys is high and the temperature coefficient is large. An alloy with 0.27 per cent carbon, 23.49 per cent chromium, gave the following data: 17.3 microhms per cu. in. at room temperature and 2.6 times this value at 1100 deg. Fahr. This test was made on 0.025-in. wire.

The permeability of the alloys is rather low, but is higher the softer the alloy. In general, the permeability is less than one-half that of cast iron. Carbon lowers the permeability to some extent, but manganese lowers it greatly.

**Physical Properties:** The mean specific heat between room temperature and 200 deg. C. was found to be 0.15; between room temperature and 600 deg. C. it was 0.165 on the same sample.

The thermal coefficient of expansion is not far from that of steel, being about 0.0000066 per deg. Fahr. in the rolled alloy. The relation is linear between 0 and 1500 deg. Fahr.

The thermal conductivity between room temperature and 100 deg. C. is about one-half that of soft steel, as shown by some rather approximate tests.

#### Hot and Cold Working Properties

**Low-carbon Alloys:** The alloys with about 0.3 to 0.5 per cent carbon have a fracture in the cast condition which depends on the rate of freezing. A casting may have a large, shiny or coarse-grained fracture with single facets extending nearly across a thin section; some grains will show a cubic crystallization under a hand glass, like galena. The transverse strength of such metal is likely to be low. The same metal, cast under different conditions and more rapidly cooled, will show a fine-grained fracture like a well-forged low-carbon steel. This refining of grain is naturally attended by an improvement in strength and these castings will be quite tough. On the other hand, in one or two instances,

a low-carbon fine-grained casting was brittle; on investigation this alloy was found full of minute inclusions; in other words, the metal would correspond to a "dirty steel." It is believed that these non-metallic inclusions act as crystallization nuclei and bring about a fine-grained structure, but one without good mechanical strength or resistance to shock stresses.

The low-carbon alloys are readily forgeable and will stand forging through nearly the same temperature range as a steel. Because of their greater hardness and toughness at elevated temperatures, they require a higher low limit for hot working than do the steels—namely, about 800 to 850 deg. C. They work best at 950 to 1050 deg. C., depending on the operation. Plate and rod have been rolled on a commercial scale with practically the same procedure as for steel, the factors affecting production being about the same as for ordinary medium-carbon steel. Wire drawing is quite practicable, but has certain differences from steel practice. More care seems to be required in the early draws, but after a few draws have been made the drafts can be considerably increased.

Hot pressing has been done on an experimental scale and has demonstrated its practicability and there are indications that cold stamping is also feasible. Seamless tubing also has been forged; the process appears to be entirely commercial.

**High-carbon Alloys:** The difficulty of hot and cold working increases with increase of carbon content; the workability seems to depend to a much greater degree on the carbon content than on the chromium. It is possible to forge alloys with 2.5 or 3 per cent carbon and 26 to 28 per cent chromium, but the forging is dif-

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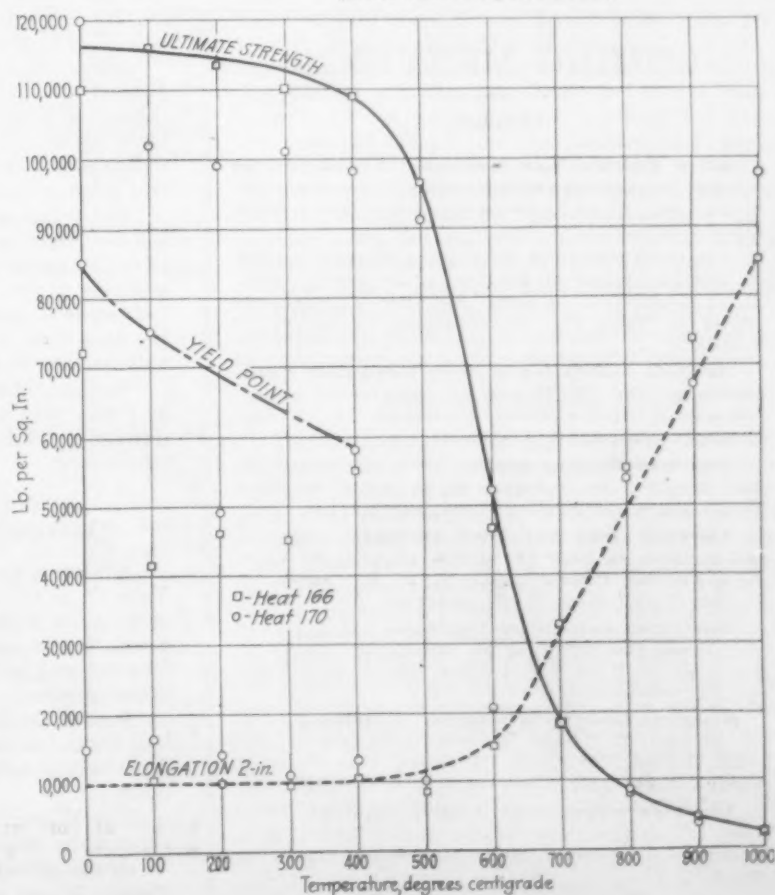


Fig. 12—Results of High-Temperature Tensile Tests



### Head of Engineering Council Resigns

ROCHESTER, N. Y., Oct. 13.—Resignation of Mortimer E. Cooley, dean of the college of engineering and architecture, University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the executive board of the Council held in Rochester, Oct. 12 and 13. In presenting his resignation to the board, Dean Cooley said that he retires on account of ill health. He also made it known that he has been granted leave of absence by the University of Michigan for the second half of the academic year 1923-1924.

Succeeding Herbert Hoover as president of the Federated American Engineering Societies, two years ago, Dean Cooley, now in his sixty-ninth year, has been identified with numerous national undertakings in the public service, notably investigation into the two-shift system in continuous industry, and the study of coal storage now going on throughout the country.

Eulogizing the leadership of Dean Cooley as productive of dignity, respect and public confidence, the executive board of the council adopted a resolution at its session, today, expressing regret that Dean Cooley is forced by ill health to relinquish the presidency of the Federation. Dean Cooley's successor will be elected at the annual meeting of the council in Washington early in January.

### Meetings of Mechanical Engineers

Following is a list of sectional meetings scheduled for the immediate future of the American Society of Mechanical Engineers:

Atlanta, Oct. 18, at the Chamber of Commerce Building. Subject: Industrial Management as Applied to the Steel Plant. Speaker: Robert Gregg, president, Atlantic Steel Co.

Buffalo, Oct. 22, at Hotel Statler. Joint meeting with Engineering Society of Buffalo. Subject: Industrial Management. Speaker: J. M. Larkin, assistant to president, Bethlehem Steel Co.

Rochester, Oct. 15, at Chamber of Commerce. Sub-

ject: Management. Speaker: Dean Dexter S. Kimball of Cornell University.

St. Louis, Oct. 26, at American Annex Hotel. Subject: Management. Speaker: W. A. Layman, president, Wagner Electric Co.

### Gear Manufacturers' Fall Meeting Program

The American Gear Manufacturers' Association will hold its seventh semi-annual meeting at the Mountain House, Lake Mohonk, N. Y., Oct. 25, 26 and 27.

Maj. Earle Buckingham, Niles-Bement-Pond Co., is scheduled to read a paper, "Analysis of Milled Gears," on the opening day of the meeting, while "Training of Shop Executives," is the subject of a paper to be presented by John Kottcamp at the second general session on Oct. 26. A. W. Copeland, Detroit Gear & Machine Co., will preside over a special meeting, also on Oct. 26, of the automotive group for the discussion of conditions in that industry.

Following the regular informal dinner at 6.30 p. m. Friday evening the third general session will convene for an address by R. M. Hudson, division of simplified practice, Department of Commerce. The fourth and last general session of the meeting will be held Saturday morning, the principal address being on "New Applications for Gears" by E. W. Miller, Fellows Gear Shaper Co., Springfield, Vt.

### Some Improvement in Finished Lines at Youngstown

YOUNGSTOWN, Oct. 16.—In this district the finished steel market shows a measure of improvement, as compared with a month ago. Orders for sheets, for instance, are more numerous, though the tonnages involved are small in most instances. There has likewise been a somewhat firmer demand for plates. The requirements for standard merchant pipe are such as to place it among the most active of finished steel lines at this time. Tin plate producers are well sold over this year and interest in this market centers chiefly on the requirements which will develop for the first half of next year.

Sheet makers are maintaining production in this district at an average of 60 to 65 per cent, and have largely reduced their unfilled tonnage, especially in black sheets, during the past month and a half. The independents are reported less favorably situated in this respect than the leading interest.

The major producers maintain they are adhering to a 3.85c. base on No. 28 gage black sheets, but a price of 3.75c. appears occasionally. Galvanized sheets are quotable at 5c. and full-finished at 5.35c. The leading independent maker of automobile body stock is operating at a rate close to normal and still has a comfortable backlog in this grade.

Merchant bars are weak, with the price nominally at 2.40c. Pig iron is admittedly weak and prices are unsteady. Standard basic is pegged at \$24 for the time being.

### Operations in the Mahoning Valley

YOUNGSTOWN, Oct. 15.—The Youngstown Sheet & Tube Co. is this week maintaining production at 75 per cent at its district properties. The Republic Iron & Steel Co. is operating around 65 per cent. Of its 18 sheet and jobbing mills at the Niles plant, eight are under power.

Among the independents in this district, the Trumbull Steel Co. is operating closest to normal, with all departments active, except a number of cold tin plate mills.

The Falcon Steel Co. is operating all of its eight sheet mills, at its Niles property.

Of the 120 sheet and jobbing mills in the Mahoning Valley, 76 are under power this week, a decline from last week, while 16 of 17 pipe furnaces are fired.

## COMING MEETINGS

### October

**West Virginia and Kentucky Association of Mining, Mechanical and Electrical Engineers.** Oct. 19 and 20. Third annual convention, Hotel Fredrick, Huntington, W. Va.

**American Society of Mechanical Engineers.** Oct. 23 and 24. Regional meeting, Chattanooga, Tenn. E. C. Patterson, general manager Chattanooga Boiler & Tank Co., Chattanooga, in charge of details.

**National Association of Farm Equipment Manufacturers.** Oct. 24, 25 and 26. Thirteenth annual convention, Statler Hotel, Cleveland. J. B. Bartholomew, Peoria, Ill., president.

**American Welding Society.** Oct. 24, 25 and 26. Fall meeting, Pittsburgh. M. M. Kelly, 33 West Thirty-ninth Street, New York, secretary.

**American Iron and Steel Institute.** Oct. 25, fall meeting in New York; Oct. 26, visit to Aberdeen Proving Ground, Md. E. A. S. Clarke, 40 Rector Street, New York, secretary.

**Society of Automotive Engineers.** Oct. 25 and 26. Production meeting at Cleveland. Coker F. Clarkson, 29 West Thirty-ninth Street, New York, general manager.

**American Gear Manufacturers' Association.** Oct. 25, 26 and 27. Fall meeting, Mountain House, Lake Mohonk, N. Y. T. W. Owen, 2443 Prospect Avenue, Cleveland, secretary.

**American Management Association.** Oct. 29 to Nov. 1. Annual convention, Hotel Astor, New York. W. J. Donald, 20 Vesey Street, managing director.



# Complete Electrification of Foundries

## Practice and Production Problem Rather Than Electric— Mechanical Molding and Sand Handling— Purchased Power Advocated

BY LEONARD W. EGAN\*

**E**LECTRIFICATION of the foundry entails more than the mere selecting and installing of motors, controllers, wiring, etc. It covers maintenance of the entire plant equipment and its production of continued, uninterrupted service. It is inseparably linked with the design and application of all the equipment and the manner that it enters into foundry production.

This is accordingly not intended as an engineering discussion, but rather as a discussion with the foundryman of the possibilities of electrified methods and systems as applied to the process of molding, together with the reasons why.

We are endeavoring to show this whole problem from the producing and the operating man's standpoint, more than from the electrical man's, the considerations being mostly tonnage, improvement of production, reduction of the man-hours per ton, both in productive and non-productive labor, simplifying the labor problem, reducing the various foundry operations to a more mechanical and stabilized basis, and eliminating the great amount of laborious operations that exist in most foundries today.

The matter has become one of foundry practice; a foundry production problem rather than an electrical one but, like the electrification of the modern steel mill, the two are so intermingled and overlap to such an extent that the electrical man of today is vitally interested in production and how and why it is done, and must be as familiar with the plant production as with the application and care of the equipment.

It was originally intended to discuss and illustrate the various styles of electrical apparatus used in the foundry. It soon became apparent that the paper would reach a prohibitive size and be reduced at last to a catalog of foundry equipment. For this reason it was decided to devote the paper to a discussion of the effect of electrification on the increase of production, the speeding up of the work and the stabilizing of the maintenance situation in general. The discussion has been divided into eight general subjects:

1. Electric molding machines:  
Roll-over, pattern draw machines, sand-slingers.
2. Sand handling systems.
3. Electric furnaces:  
Melting furnaces for non-ferrous metal; core ovens.
4. Cranes.
5. Purchased power.
6. Electric welding.
7. Safety.
8. Air and electric hoists.

### Molding Machines

There is great need in the foundry of reducing, as far as is consistent, the making of a mold to a predetermined mechanical operation, the sequence of which has been previously worked out and determined upon. This should be developed to the highest degree obtainable in order that the production of the mold may be accomplished without dependence upon the personal skill and judgment of the workman.

Adoption of mechanical molding by the use of molding machines reduces the greatest part of the mold production to a mere predetermined mechanical routine action. This permits the use of a cruder grade of labor in about 80 per cent of the operation and, in conjunction with overhead bins and flask filters, entirely eliminates the laborious work which was heretofore the heritage of the molder.

Molding machines are divided into four general classes; squeezers, plain jolters, pattern stripping machines and roll-over-jolt pattern draw machines, all of

which have been operated by compressed air heretofore.

Each type of machine has its own field of application, from the squeezer, mounted on wheels and rolled from place to place and used to a large extent in stove plate foundries and the production of small castings, to the direct-draw, roll-over jolt machines with pattern draw, used for the production of heavy castings on both copes and drags, where accurate drawing of the pattern is required.

Two outstanding features which might be called epochal, in the electrification of machine molding, have been brought out in the last few years. These are the roll-over-jolt-pattern-draw machine, with electrically operated pattern draw and roll-over, equipped with electrically operated runout car, and the sand-slinger.

### Roll-Over Pattern-Draw Machine

Made by the Osborn Mfg. Co., Cleveland, the roll-over pattern-draw machine has been electrified in all of its operation except that of the jolt, which is still air operated. Some investigation has been made in the past for electrifying this portion of the machine, but to date no satisfactory substitute for the air cylinder jolt has been found. There is an instant reversal at the end of a stroke of the moving parts, including the mold on the table, without rebound which is required for the packing of the sand and to allow for the escape of air by filtering out between the particles of sand. The most logical method of producing this effect electrically would be to do it magnetically.

Electrification of the power operations of the machine renders them positive and uniform in their action and increases the speed of the machine to a degree not heretofore possible in the air operated machine. This has been a pioneer movement in the electrification of the molding machine and, while it has not been complete in all the movements of the machine, those that are operated electrically have shown such gratifying results, such savings in time and money, resulting from the improved service of the machine and the unprecedented speeding up of the molding operation, that study is being given to the electrification of the jolting mechanism of the machine.

Now that it has been demonstrated so conclusively that the electric molding machine is superior to the air operated one, it is only a question of time until other types of machines will be electrically operated.

### Sand-Slinger Molding Machine

The sand-slinger molding machine, made by the Beardsley-Piper Co., Chicago, employs a radically different principle in its operation from that of any other type. The sand is pitched or thrown into the mold at a high velocity, which rams or packs it around the pattern. The operation is analogous to the old practice of the molders throwing handfuls of compressed sand into the depressions and pockets of an irregular pattern.

Briefly, the machine consists of a spindle or revolving shaft, with an electric motor direct connected at one end and an impeller head upon which a hand or cup shaped casting is attached. The impeller head rotates at motor speed, usually about 1200 r.p.m. for iron castings and 1800 r.p.m. for steel castings. At each revolution of the head a lump or slug of compressed sand is slung into the mold at a velocity of from 2700 to 6000 ft. per min., and at the rate of 5 to 10 cu. ft. per min.

The machines are made in four types or arrangements: stationary, tractor, locomotive and portable. Each type has its field of application in the foundry.

The stationary type is for use in foundries which

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have a sand conveying system or other equipment arranged to supply sand to the machine. It may be used in conjunction with two stripping-plate machines and located between them.

The tractor type is a combination of slinger, sand cutter and elevator, self contained in one machine and mounted on wheels. The machine tows cope and drag patterns either on carts or mounted on strippers. The molds and flasks may be handled with overhead cranes or by special crane towed by the machine.

The locomotive type is for adaption for specialty or jobbing foundries where a number of castings are made from one pattern. The machine is mounted on wheels and travels on rails, having a track gage of 9 ft., and moves under its own power.

#### Portable Machine

The portable type differs from the tractor type in that it is not mounted on wheels nor equipped with sand cutter screws. It must be carried from place to place in the shop and the sand must be delivered to it at the bucket elevator, where then all the rest of the operations of the tractor type slinger are repeated. Great flexibility is claimed for this machine; it will ram any size mold and can be placed anywhere on the floor and then moved to a new location at will. It can be used on pit jobs or on any flask. On long molds such as engine frames, and so on, the machine can be used first on one end of the flask and then on the other end.

One of the chief drawbacks to machine molding has been the costly installation in air compression, air receivers and connected piping necessary to serve the machines when they were installed. The absence of sufficient air compressor capacity has been one of the principal reasons against the more general use of machines in the foundry. This condition will be eliminated with the advent of electrically driven machines; practically no special apparatus will be required outside the self contained machine itself. One of the aims of electrification is to reduce the air load to a minimum. The air systems of the foundries, especially some of the larger ones, are great wasters of power in the air lost through leaks. One installation was noted where about 30 per cent of the total air compressed was required to furnish air for the leaks. Except for the sand blast, the portable air hammers and rammers and the jolt mechanism of the molding machines, the air compressor could be entirely eliminated in foundries.

#### Sand Handling Systems

A complete, well built and motor operated sand handling and conditioning system is needed in every foundry of any importance. The work entails a number of operations. The sand, after being shaken out of the flask, must be collected; it must be screened and the foreign matter in the shape of scrap, nails, gagers, etc., removed; new sand must be added to rejuvenate the old; the mixture must then be tempered, mixed and aerated; it must be left to rest for a short period, to get a uniform moisture content, and finally the prepared sand must be returned to the molders.

Certain standard units that go to make up the system are used. In a typical arrangement, the sand is conveyed by belt or other type of conveyor, from the floor; is passed through a priming screen for the removal of the larger foreign matter; is raised in an elevator to another screen for removal of other foreign matter; is passed over a magnetic separator; is passed through a tempering, aerating and cutting machine; thence usually into a temporary storage bin. It then passes through a feeding cutter for continuously cutting the tempered sand and feeding it by overhead conveyors to individual overhead hoppers in front of the molders.

There are other applications, especially in the smaller jobbing foundries, where a less elaborate and more self-contained system has been worked out, which is now standard. The sand is carried to a hopper on the handling system by bucket. It is then screened, cut, conditioned and returned to a storage hopper, whence it is distributed by bucket to the molding floor.

A system of this nature can be installed in any average foundry. This type of sand system forms a highly efficient unit in the jobbing foundry.

#### Electric Furnaces

The electric furnace is entering largely into the manufacture of castings by the steel melting furnace, the annealing and heat-treating furnace and furnaces for the melting of non-ferrous metals—copper, brass, bronze, aluminum, zinc, etc. It is represented also by the low temperature oven for baking cores, a unit that is receiving favorable consideration in foundry production, and is coming into more general use.

In the electrification of the industry, the steel melting furnace has a broad field of application in the jobbing foundry, especially where it can be run near to its capacity. However, in the larger steel foundries the open-hearth furnace holds a strong position and, where large tonnages are handled, will form the main process of melting for some time to come.

Electric annealing furnaces and heat-treating furnaces have had a considerable development in the past five or six years, especially the treating furnace. It has a high degree of flexibility and, where quantity production and a uniform type of casting is possible, it offers unlimited possibilities in heat treatment. The use of this type of furnace gives complete control of the temperature, of the atmosphere, and of the manipulation.

It permits an unlimited and sequential repetition of the treating cycle. It permits the unidirectional, continuous flow of the product through the furnace, entering at the cold end and leaving at the hot end. This permits the casting to be heated progressively over a uniform range, so desirable in heat treatment. It eliminates the human factor to a high degree, thus placing the treatment of the product more in the hands of the metallurgist and less in the hands of the furnace attendant.

Under average foundry conditions the electric annealing furnace cannot compete with the combustion type of furnace in fuel costs but, where uniformity of the product or nicety of the treatment is involved, the electric furnace has no equal. Heat treated castings have not heretofore been considered to any great extent, but rather it has been largely a question of getting sufficient section in the casting. The near future, however, will see a reduction of the section and weight of castings, with a corresponding increase in strength, necessitating heat treatment, and there will be a field for the electric treating furnace there.

In the melting of non-ferrous metals such as copper, bronze, brass, aluminum, zinc and the multitude of special metals and alloys, including cupro-nickel metals, bearing metals, white metals, etc., the electric furnace is finding a broader application every day. The development of the electric furnace in this field has been more significant and far-reaching in its effect than in any other branch of the art.

There are four principal types of electric furnaces in use in this branch of melting: The open arc, the muffled or smothered arc, the resistance and the induction furnace.

The direct or open arc furnaces are represented by a number of makes and types such as the Snyder, the Booth-Hall, the Volta, the Geolette, etc. The Geolette furnace, however, is in general use for brass melting by the arc process. The muffled arc furnace is represented by one type only, the General Electric. The resistance furnace also is represented by one type only, the Bailey. The induction furnace is represented by two types, the Ajax-Wyatt and the General Electric. [Some of the outstanding features of these furnaces, as outlined in this paper, form the subject of a later article in THE IRON AGE.—The Editor.]

#### Core Ovens

Electrically heated core ovens are coming into more general use every day, not only because of the vast improvement in the quality of the cores but, where the cores are irregular in shape, and of the smaller variety, heating can be done cheaper and faster. The cost of attendance is greatly reduced in the electrically heated



oven as compared with the fuel-fired oven. The cost of maintenance is almost negligible, since the temperature throughout the entire oven is uniform and is not much in excess of the baking temperature of the cores themselves. Combustion furnaces arranged with pit construction for coke, oil and coal involve frequent renewals and replacements.

The electric core oven may be of the car type, the rack type or the drawer type. Car type ovens usually are arranged in size about 5 x 8 x 10 ft., which lines up with a number of the ovens in the larger foundries. The heating elements or resistors are usually placed under the car, along the length of the floor and also along the length of each side wall, three or four tiers high.

#### Cranes

In the average foundry the cranes receive an enormous amount of abuse, most of which is unnecessary. The use of a foot-brake is a rarity in a foundry; the author has viewed cranes in a foundry without foot-brakes, fuses or other current protection, and the hoists without either load brakes or arranged for dynamic braking. The cranes or their trolleys are used for dragging cars, buggies and flasks around the floors and from one place or building to another, all without consideration for the effect on the crane in general or the motors in particular. Usually the trolleys are equipped with a 3 to 5 hp. motor, instead of 15 hp., where this type of service is required.

Such a crane should be heavily braced and should be of a wide span to keep it square and rigid. It should have large motors to withstand the enormous demand upon it by the quick starting, increased speeds and abusive plugging. It should have all the mechanical parts so arranged that replacements can be made in the shortest possible time, and by crude workmen if necessary. The cycle of operations to which the crane will be subjected, the excessive rate of acceleration and deceleration, the abnormal plugging of the motors, all side pulls and dragging operations and the speeds required, should be carefully looked into.

Where a scrap yard runway is provided it is usually of the typical single girder arrangement, with no connection between the two girders, each being supported independently of the other. The head room from ground level to crane rail, in most cases about 25 ft., limits for all time the piling height of the stock. The tendency of late years has been to build the runways higher and tie them together above the crane. In one installation, the runway columns were mounted on piers 7 ft. above ground level, and the total head room from floor level to crane rail was 42 ft., or 17 ft. higher than in the old single girder construction. The advantages to be gained by this additional piling height are important. In any event, no other method of handling scrap equals that of the overhead crane.

#### Purchased Power

A foundry is intended solely for the purpose of manufacturing and selling castings. When it enters the field of the manufacture of power it takes over an enormous amount of troubles, worries and trials which attend this branch of manufacture, and in addition it is compelled to compete with a highly developed business by the public service corporations in the conversion of heat into electrical power.

For the small, inefficient power plant to attempt to compete with the service corporation of today is an extravagance on the part of the foundry owner. In the last few years the dependability of the service furnished by the central station plants has so improved that the former interruptions are now becoming rarities.

#### Electric Welding

Welding of castings occupies a very important position in their reclamation, chiefly by welding and plugging. A large amount of this work is still done by the gas process and there are a large number of acetylene gas generating plants in the foundry industry. There is no logical reason why gas welding should be used; it is possible to take a portable truck type electric welder to any location that a set of tanks can be

taken and, aside from portability, no excuse exists for gas welding. It is possible to perform the same amount of welding by the arc process as by the gas torch, at a great reduction in cost. For cutting, however, the gas torch is more applicable than the electric arc.

#### Air and Electric Hoists

Air cylinder hoists are used to a large extent in the foundry industry, chiefly in conjunction with hand-moved jib cranes. They are wasteful users of power by reason of the leakage of air around the valves and piston rods and in the connected piping. There is no logical reason why these hoists should be operated by compressed air, in fact, even neglecting the leakage, the electric hoist will operate at less than half the power cost of the air hoist.

In a discussion of the relative merits of the two types of hoist, figures were submitted to show the amount of power used by an air cylinder hoist and an electric hoist. For purposes of comparison, take a 1-ton hoist making 100 capacity lifts per day; 6-ft. lift; direct current. Current consumed by the electric hoist was figured out at 814 watt-hours per day or 244.2 kwhr. per 300-day year. The air hoist, at 100 lb. receiver pressure, called for 27.7 watt-hours per lift, 2.77 kwhr. per day or 831 kwhr. per year. This is three times as much as the electric hoist needed. Electric operation of the compressor was assumed, because it is more economical than steam operation.

In conclusion, the advancement toward the complete, stable and dependable electrification in the foundries, that now exists in the steel mills, will not receive the corresponding impetus as that of the steel mill until the foundry managements recognize the necessity of giving a higher standing to the electrical man. They must give him higher authority, allow a broader scope in his efforts, more consideration for his opinions and recommendations in the development of the industry. On the other hand, they should demand of him a broader knowledge of industrial-electrical applications and maintenance management in general.

#### Discussion

It was pointed out that one of the main drawbacks to machine molding, particularly in a small foundry, lies in the air compressor. This is an expensive piece of equipment of low efficiency, particularly when account is taken of the apparently unavoidable leakage of air through the valves and the joints of the line. By operating molding machines by electricity, all of these elements of inefficiency and high cost are overcome.

E. S. Carman, chief engineer Osborn Mfg. Co., Cleveland, and past-president American Society of Mechanical Engineers, pointed out that the mechanical molding process is in its infancy. It has been known in successful form for only 20 years, while only 11 years have elapsed since it became possible commercially to ram the mold, turn it over, and draw a pattern out by machinery. He mentioned a particular case in the Bethlehem Steel Corporation where a mold, weighing 12,500 lb. and measuring 4½ ft. x 9 ft. x 19 in. was turned out at the rate of 150 per working day at 7½ hr. This means one of these large molds every 3 min. Because of this high rate of production, it was necessary to handle it with great expedition, the raising of the mold for turning over taking only 16 sec., while it was turned and lowered in another 7 sec.

According to Mr. Carman's experience, the resilient action such as is obtained from air destroys the mold surface as the pattern is being drawn from it, because there is a cushioning effect which is ended by a sudden jerking from the mold as the pattern is drawn. This is not so with electrical appliances, as the pull is uniform and without a jump. Devices electrically driven are arranged with automatic control so that the first 2 in. of raising of the pattern goes slowly, changing then to a rapid elevation to get the pattern out of the way. The same considerations have to do with rolling the mold over.

On the other hand, certain resiliency is needed in the jarring of the mold and the speaker does not believe it feasible as yet to apply electricity to this part



of the process. Electricity, however, he states, is much cheaper for all the other operations.

#### Trend of Price in Fuels

F. A. Coleman, president F. A. Coleman Co., Columbus, in speaking of fuels for core ovens, listed the four items: coke; oil; gas (manufactured and natural); electric current. Of all these, he considers electricity the most universally available. He eliminated natural gas because it is fast disappearing. Coke is placed at from \$5 to \$12 per ton, varying with locality; oil at 3c. to 10c. per gal.; gas at from 40c. to \$2 per M. cu. ft. and electric current from 0.3c. to 5c. per kw-hr.

Of these four fuels, the general price trend during a period of years has been steadily upward, except with electric current, where the trend has been downward. Coupled with this fact is the steadily increasing field of application of electric current, which is causing it to crowd out other fuels.

The speaker pointed out the uncertain control of core oven temperatures, except for the thermostatic control of electric ovens. Oil varies in fluidity, and consequently in supply, and as the air supply fluctuates, there may be smoke at one extreme or explosive conditions at the other. The tendency of purchasing agents to buy coke at a low price results in uncertain quality, frequently poor, which spoils the cores and costs more than a good quality of coke. All advantages appear to lie with the electric oven.

Only with large production does the car type oven pay. The drawer type permits continuous operation with practically no leakage of heat during the withdrawal of the drawer, for the solid back end closes the furnace as effectually as the solid front end. With the rack type, however, there may be a drop of 200 deg. or more, from the desired oven temperature of 400 to 425 deg., every time the rack is drawn out and a new

rack of cold cores inserted. The drawer type gives twice the output per square foot of area and consequently has only half the fuel cost per ton of cores.

#### Advantages of Direct Current

James A. Shepard, president and chief engineer Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., made a plea for direct current motors, particularly for hoisting work, because of greater simplicity of equipment and ease of control. He stated that the only advantage of the a.c. motor is the fact that it has no commutator.

This question of simplicity and ease of control assumes a particular importance in view of the large proportion of the time of the crane which is not employed in actual hoisting. The idle movements of getting to the place of work, lowering the chain and getting the slings adjusted around the piece to be hoisted, as well as the idle movements following the deposit of the piece at its destination, take far more time than the actual hoisting, transporting and lowering of the piece. It is possible with d.c. motors to perform these idle movements at 2½ times the a.c. speed. Equating this over the proportionate time of the crane shows that the d.c. equipment may have 25 per cent more useful activity per hour than with a.c. motors.

Mr. Shepard made a special plea for a new factor of safety in designing cranes and other machinery, which should be based upon the elastic limit of the material instead of on the ultimate stress. He pointed out that this would diminish largely the present practice of operators to overload cranes and other equipment to a dangerous degree—a practice which in some cases has resulted in stressing materials beyond their elastic limit and thus producing permanent deformation, resulting in inaccuracy of operation and a condition altogether dangerous.

## INCREASED PRODUCTION

### British Empire Steel Corporation Makes Substantial Gain Over Last Year

TORONTO, Oct. 15.—The British Empire Steel Corporation, Montreal, Que., reports production for the first nine months of 1923, showing substantial gains over the corresponding period of 1922, notwithstanding the drawbacks of labor troubles, and it is evident that the demand for the company's products has undergone a marked revival. The coal production for September last totalled 414,857 tons as compared with 425,045 tons for the corresponding month a year ago. The August, 1923, output reached 553,023 tons, as against 225,492 tons in August, 1922. For the first nine months of the present year, including September, the output of coal totalled 3,924,630 tons as compared with 2,838,180 tons for the corresponding period last year. This favorable showing was made despite the fact that the month of July was lost owing to the coal strike.

The production of pig iron for the first nine months of this year reached a total of 193,072 tons as compared with 63,127 tons for the same period of 1922. Ingots produced amounted to 220,725 tons compared with 56,395 tons in 1922, and the production of blooms reached 191,885 tons in the nine months ending with September last as compared with 55,520 tons for the corresponding period a year ago.

The increased activity of the corporation's plants is indicated by the following figures dealing with coal, ore and limestone consumed during the nine months under review:

	1923 Tons	1922 Tons
Coal .....	642,535	245,161
Wabana ore .....	248,820	111,537
Limestone .....	152,456	164,027

The decrease in the consumption of limestone is purely temporary, and is of no great significance. One of the most encouraging features in the outlook is the fact that there has been of late a marked decrease in labor agitation.

One source of keen disappointment to the British Empire Steel Corp. has been the loss of its German

trade in iron ore from Wabana. The occupation of the Ruhr, with its consequent closing down of factories and its injection of a hazardous element in the credit situation in respect of these shipments, cut off what was becoming a very profitable market and one that was counted on to produce about \$500,000 profit to the corporation this year. The business lost has, however, been compensated for in some degree by new business gained elsewhere. The company has shipped iron ore to Wales this year for the first time since 1913. Shipments have also been made to the United States, the first since the beginning of the Great War. In finished steel the company has recently closed good business with Japan, for reconstruction purposes following the earthquake, and it is predicted that before the end of November three vessels will have sailed to Japan from the company's plants.

### Steel Corporation's Orders Decline Again

Unfilled business on the books of the United States Steel Corporation as of Sept. 30 amounted to 5,035,750 tons, or 378,913 tons less than on Aug. 31. During August unfilled orders decreased 496,100 tons, in July 475,498 tons, in June 595,090 tons, in May 307,158 tons, and in April 114,823 tons, while in March they increased 119,343 tons, in February 373,213 tons, and in January 165,073 tons. A year ago the unfilled business was 6,691,607 tons, or 1,655,857 tons more than on Sept. 30 last. Following is the unfilled tonnage as reported by months since January, 1920:

	1923	1922	1921	1920
Jan. 31.....	6,910,776	4,241,678	7,573,164	9,285,441
Feb. 28.....	7,283,989	4,141,069	6,933,867	9,502,081
March 31.....	7,405,332	4,494,148	6,284,765	9,892,075
April 30.....	7,288,509	5,096,913	5,845,224	10,359,747
May 31.....	6,981,351	5,254,228	5,482,487	10,940,465
June 30.....	6,386,261	5,635,531	5,117,868	10,978,817
July 31.....	5,910,763	5,776,161	4,830,324	11,118,468
Aug. 31.....	5,414,663	5,950,105	4,531,926	10,805,038
Sept. 30.....	5,035,750	6,691,607	4,560,670	10,374,804
Oct. 31.....	.....	6,902,287	4,286,829	9,836,852
Nov. 20.....	.....	6,840,242	4,250,542	9,021,481
Dec. 31.....	.....	6,745,703	4,268,414	8,148,122

The largest total of unfilled orders was on April 30, 1917, at 12,183,083 tons. The lowest was on Dec. 31, 1910, at 2,605,747 tons.

# American Society for Steel Treating

Fifth Annual Convention and Exhibition at Pittsburgh  
Establishes a Record—Excellent Papers and a  
Large Attendance

**A**N organization which can successfully stage a technical convention and exhibition of the high order and magnitude of the one held in Pittsburgh last week, Oct. 8 to 12, by the American Society for Steel Treating, at once takes its place in the front rank of societies of this class. That this has been possible after only four years of existence is the striking fact. The event, both from the technical and exhibition standpoint, has become one to be looked forward to with keen interest. Out of a total membership of over 2700 there was a registered attendance of nearly 1500, exceeding any previous meeting. The membership registered at Detroit a year ago was about 1250. In expansion, enviable progress was made in that the net increase in membership in good standing last year was about 18.75 per cent.

The technical sessions without exception were featured by large audiences and an enthusiasm naturally the accompaniment of a large group of comparatively young men. The papers on the whole compare favorably with those in the programs of some of the much older technical organizations. The only drawback was the unavailability of so many of them in printed form.

The steel exhibition was the most successful of the kind ever held anywhere and it was also the largest. Entire satisfaction was voiced by nearly all those who had booths, many of them reporting excellent business booked or in prospect. The experiment of not opening the exhibition until afternoon of each day appeared to be a success.

## The Technical Sessions Well Attended

**P**APERS of a high order, both theoretical and practical, were presented at the technical sessions. Very few, however, were available in printed form before delivery. Out of over 30 scheduled papers, only about 25 per cent had appeared in print before the convention. As is often the case, free discussion was therefore hindered, though in some cases the net result was satisfactory. The attendance at the main or principal technical sessions was excellent and keen interest was evidenced. The fact that the exhibition was not open in the morning was beneficial to the morning programs, which were carried out in the ballroom of the William Penn Hotel. The five morning sessions of the five days, Oct. 8 to 12, were all technical except the annual meeting on Oct. 10. The afternoon sessions, which were less formal and elaborate, were all held in a small room on the lower floor of Motor Square Garden, where the exhibition was held, six miles from the hotel headquarters. These were largely symposiums or round table discussions. Compared with the Detroit convention last year, the technical sessions as a whole were not only of a higher order but were much better attended. Undoubtedly the separation of the exhibition from the convention in the forenoons was a successful experiment. Very few if any papers stood out above all others in the programs. The one on "Conical Illumination in Metallography" may be pointed to, however, as striking in its revelations and as of wide significance in the future. The papers on theories of the hardness of steel by Dr. Zay Jeffries and Dr. E. C. Bain were both outstanding contributions to the subject. A new development this year was the presentation by title of three papers by eminent metallurgists of England, France and Japan.

### Session on Lathe Tools and Steel Hardness

A session, regarded by some as one of the best of its nature ever held, embraced papers by leading authorities on lathe tool performance, discussed by H. J. French and Jerome Strauss of Washington; on theories on the causes for the hardening of steel by Dr. Zay Jeffries, R. S. Archer of Cleveland, and Dr. E. C. Bain of Dunkirk, N. Y., and on the crystal-

lization of iron and its alloys by Prof. Albert Sauveur of Harvard University, Cambridge, Mass.

#### Effect of Heat Treatment on Lathe Tools

The time-temperature relation in the hardening and tempering of high-speed steels and their effects upon lathe tool performance, constitution and dimensional changes, were discussed in a paper on the "Effect of Heat Treatment on Lathe Tool Performance and Some Other Properties of High-Speed Steels," by H. J. French, physicist Bureau of Standards; J. Strauss, material engineer United States Naval Gun Factory, and T. G. Digges, assistant physicist Bureau of Standards, Washington. The paper was read by Mr. French at a morning technical session presided over by H. M. Boylston, professor of metallurgy, Case School of Applied Science, Cleveland.

Comparisons of endurance are given at various cutting speeds of the four most important of the current steel types for roughing tools, and the relative advantages and disadvantages of each are discussed. In addition, the "Taylor" and "breakdown" tests for lathe tools are compared and some of the limitations of the former are described in detail. Finally, the prevention and elimination of so-called "flaky fractures" in the heat treatment of high-speed steels are considered. The present tests supplement those described in Bureau of Standards Technical Paper, No. 228, on "Lathe Breakdown Tests of Some Modern High-Speed Tool Steels," by Messrs. French and Strauss. Practical conclusions drawn from the tests are summarized in the paper.

#### Hardness of Steel and the Causes

"The Hardening of Steel," a paper by Zay Jeffries and R. S. Archer, research bureau, Aluminum Co. of America, Cleveland, read by Mr. Archer at the same session, was actively discussed. It is of a theoretical nature, giving a general definition of hardness, a brief statement of a general theory of the hardening of metals and a detailed conception of the nature of hardened steel and the causes of its hardness. Martensite is considered to owe its hardness chiefly to the very small grain size of the alpha iron of which it is composed. Ageing or mild tempering causes a precipitation of very fine particles of cementite, which constitute an additional hardening factor. The softening of the hardened steel by tempering was stated to



be due to the growth of the alpha iron grains and of the cementite particles. S. L. Hoyt, General Electric Co., Schenectady; E. C. Bain, Atlas Steel Corporation, Dunkirk, N. Y., and Professor Ellis, University of Toronto, were among those who took part in the discussion.

#### Secondary Hardness of High-Chromium Steels

E. C. Bain, research metallurgist Atlas Steel Corporation, Dunkirk, N. Y., in a paper on "Secondary Hardness in Austenitized High-Chromium Steels," gave a summary of hardness measurements made with the Rockwell hardness tester on four grades of high-carbon, high-chrome steel with a variety of quenches and a series of draws. Photomicrographs of the steels at certain characteristic stages were shown. In all the steels a quench from a high temperature produced an austenitic state which was permanent at room temperature and rendered the steel quite soft. Reheating to 900 to 1100 deg. Fahr. martensitized these austenitic steels and restored the hardness to nearly what could be developed in a lower quench. Steels quenched for the maximum hardness (martensitic) gradually softened by drawing up to 700 to 800 deg. Fahr., then more rapidly at higher draws. In these experiments the ordinary heat-treating furnace was used and specimens were drawn in an electric furnace, representing ordinary practice.

A paper on the "Effect of Temperature on the Impact Resistance of Low-Carbon Steel Which Has Been Worked or Deformed at Different Temperatures," by F. C. Langenberg, metallurgist Watertown Arsenal, Watertown, Mass., was presented by title.

#### Dendritic Segregation and Heat Treatment

A description of the dendritic crystallization of iron-carbon alloys and its further transformations, with emphasis on the importance of its study, is given in a paper on the "Crystallization of Iron and Its Alloys," by Albert Sauveur, professor of metallurgy, Harvard University. In this paper, which was pre-printed in the society's July *Transactions* and read by title at the meeting, it is shown that the properties of steel depend upon its microstructure and its persistent dendritic segregation, and that the latter is not affected by the usual heat treatments, while hot working causes deformation of the segregated areas and results in directional properties. The action of certain reagents in revealing dendritic segregation is explained, as well as the relation existing between the dendritic or solidification structure and its microstructure.

In conclusion it is stated that, leaving out of consideration the chemical composition and the presence of inclusions, it seems reasonable to assume that the physical properties of steel depend (a) upon its microstructure and (b) upon its persistent dendritic segregation. It is pointed out that the influence of the microstructure has been exhaustively studied, but that the dendritic segregation has been much neglected; Indeed, there are many who do not even suspect its existence. The paper is a plea for the study of that influence. Brief discussion of Professor Sauveur's paper was presented by Professor Ellis, University of Toronto, and E. E. Thum, Linde Air Products Co., New York, the latter taking exception to some statements of the author.

#### Session on Carburizing

One of the most interesting technical sessions of the entire convention was the one held Tuesday morning, Oct. 9, devoted almost entirely to the general subject of carburizing, with A. H. D'Arcambal, metallurgist Pratt & Whitney Co., Hartford, Conn., in the chair. The first paper presented was "Measurement of Carbon Penetration in Carburized Steels," by S. P. Rockwell, consulting metallurgist, Hartford, Conn., and Frederick Downs, chemist New Britain Machine Co., New Britain, Conn. Mr. Rockwell presented the paper in abstract. The object of the investigation was announced as an attempt to determine, if possible,

whether any relationship exists between different steels under different methods of measuring depth of case hardening. There are many methods of depth measurement, some of them more important and more commonly used than others. The most generally used methods were enumerated as follows:

1. A sample taken directly from the carburizing pot, quenched direct and broken.
2. A sample taken directly from the carburizing pot, quenched or cooled slowly, single or double treated, and broken.
3. The foregoing samples, enumerated under methods 1 and 2, polished and etched with acid and a scale measurement made of the depth.
4. The samples enumerated under method 3 examined and measured with the aid of a microscope.

Five major case-hardening steels, recommended by the Society of Automotive Engineers, were selected for the test. The steels used were as follows: S. A. E. 1015, 2315, 3115, 6120, and a 5 per cent nickel case-hardening steel equivalent to S. A. E. 2512. The authors then give details of the results on these five samples and offer the following general conclusions:

1. Examination by microscope of pot cooled samples or by scale, which is not always practical, shows that measurement at this stage is indicative of a case depth considerably less than quenched samples.
2. In general the double-treated specimens show the greatest depth by various measurements. This is particularly true of the alloy steels.
3. It appears that there is as much as 70 per cent difference in case depth by measuring under different methods and different heat treatments.
4. In general as regards hardness of case the single treated specimens show the best hardness of case.
5. In general the core hardness of the pot quenched specimen is harder than specimens subsequently quenched.
6. This report shows the necessity of a more definite set of specifications to describe case depth.

In the discussion, H. M. Boylston, professor of metallurgy Case School of Applied Science, Cleveland, asked Mr. Rockwell what the criterion was for getting the depth of case, stating at the same time that there is considerable difference of opinion as to how far into the steel one should measure the case. In reply, Mr. Rockwell said that no matter what method is used he considers that the fracture is pretty fairly defined. This is particularly true in the etched specimen, the fracture being well defined to the eye.

Asked by the chairman as to which steel showed the greatest depth of hardening under the same conditions, Mr. Rockwell stated that he thought that 5.50 per cent nickel showed the greatest depth, with the regular nickel steel next.

The chairman then called upon various members for a statement of their method of measuring the depth of case. H. B. Northrup, metallurgist Diamond Chain & Mfg. Co., Indianapolis, stated that his method was to test the fracture and judge it under the microscope, with the line of demarcation generally where a marked increase in carbon content is shown between the core and the case. L. A. Lanning, assistant metallurgist New Departure Mfg. Co., Bristol, Conn., testified that, in their regular routine testing, it is their custom to use a double-treated specimen taken from the pot. A piece is withdrawn from the pot when we assume it has been there about the correct length of time, and hardened in oil; this is cooled in the air and then reheated and hardened in oil or then reheated and quenched in water. The depth of fracture is judged by the eye.

A. B. DeForest, research department American Chain Co., Bridgeport, Conn., stated that a good deal of work has been done on the magnetic test, correlating the magnetic with the depth of hardness, and that it has become apparent that the depth of hardness, as seen by the fracture and as determined by the etched specimen, varies in its ratio according to something that is not determined. For example, in the case of a few hundred specimens, there would be a 50 per cent variation in the difference between two methods of determining the depth, and he said that it has been found that the depth as determined by the single quench fracture was quite misleading, if the gradation from the highly concentrated case was gradual.



The author, Mr. Rockwell, said he felt that an explanation ought to be made that in a great many carburizing operations even a 50 per cent variation in the depth case is not detrimental.

#### Case Hardening Cast Iron

A comparatively new subject, the case hardening of gray cast iron, was presented by H. P. Knowlton, instructor Central Continuation School, Milwaukee, Wis., under the title "Case Hardening and Other Heat Treatment as Applied to Gray Cast Iron." The paper describes certain experiments which were conducted in heat treating gray cast iron, after a report had been received that such iron could sometimes be case hardened with commercial success. Some of the treatments used are similar to those used in case hardening steel. Several other schemes of heating and cooling were used and described in the paper. It was found, said the author, that under certain conditions gray cast iron can be made much tougher in the center and, and at the same time, be given a hard surface.

The author states in his conclusions that the paper is not complete and exhaustive enough to be the basis for any final statement, because there are many things yet to be worked out. He states, however, that his work demonstrates the possibility of greatly improving the quality of gray cast iron. The best samples dealt with in the paper were hard and, at the same time, had a toughness almost comparable with that of a case-hardened low-carbon steel. He reports that they were considerably stiffer than malleable castings, and that it would seem that the production of such a combination of properties from cheap gray cast iron might have considerable commercial value.

In the discussion, H. J. French, Bureau of Standards, Washington, stated that he was not quite convinced that it is proper to refer to this heat treatment as a carburizing or even a case-hardening action. He asked the author whether it is not possible to produce the same results without imbedding the samples in a carburizing compound, or isn't it possible that there is a surface reaction between the compound and the metal so as to promote diffusion? In reply, the author showed photomicrographs on the screen of some results obtained by heating in clay for 3 hr., stating that in the latter case the depth of case was much less.

#### Barium Carbonate in Cementation

The paper entitled, "The Influence of Barium Carbonate upon Wood Charcoal Used for Cementation," by B. F. Shephard, metallurgical department Ingersoll-Rand Co., Phillipsburg, N. J., was presented in abstract by S. C. Spaulding, metallurgist Halcomb Steel Co., Syracuse, N. Y. The paper gives the results of a series of experiments, the results of which are given as follows:

1. Additions of barium carbonate increase the depth of carbon penetration obtained with wood charcoal used as a carburizing agent, small percentages being more effective than larger amounts.
2. These compounds are not suitable for commercial mixtures, the shrinkage being high, the increase in weight when packed also high and the compound dusty, dirty and disagreeable to handle.
3. Chrome-vanadium steel absorbs carbon much more readily than a simple carbon steel, regardless of the strength of the compound. It also produces a hyper-eutectoid zone of such depth and carbon concentration as to be extremely harmful.

In the absence of the author the discussion was limited. Mr. Spaulding, however, called attention to the statement regarding chrome-vanadium steel, especially the reference that this steel produces a hyper-eutectoid of such depth and carbon concentration as to be extremely harmful. He stated that he had carburized some chrome-vanadium steels and, although they absorb carbon more readily than a straight carbon steel, still unless the time is unusually long he did not realize that the case was necessarily such as to be unsuitable for use. Another member, Mr. Chandler, stated that while he was with the Ford Motor Co. he used many thousands of tons of barium

carbonate for case hardening; that it is true that a hyper-eutectoid zone will thus be formed, but that generally it is crowded to within one or two points of the outside and is ground off.

#### Salt Baths and Containers

A paper which excited considerable interest was entitled "Salt Baths and Containers," by Sam Tour, metallurgist Doehler Die Casting Co., Brooklyn, N. Y., and chairman of the New York chapter. The author discusses certain salt baths used by W. J. Merten, discussed in a paper in *Forging and Heat Treating*, entitled, "Molten Salt Baths in Heat Treatment." Other subjects considered are desulphurization in such baths, decarbonization, and the question of containers. He recommended that these should be thin-walled; as strong as possible at the operating temperatures used; possess resistance to oxidation; not made of cast iron; and not possible of being acted upon by the salt mixture. The author's conclusions are briefly as follows:

For fine heat treating work on delicate and expensive pieces, an intermittent or "batch treatment" is necessary. A good salt bath, for temperature range from 1150 to 1650 deg. Fahr., consists of equal parts of barium, calcium and sodium chlorides. Desulphurization is accomplished by use of cast iron chips. Pitting and decarburization do not go hand in hand. Many baths develop decarburizing properties with use. Decarburization, however, is usually quite small. Furnaces should be properly designed and operated to obtain maximum service from containers. High chromium alloy pots deteriorate from action of a chloride bath. Cast steel and pressed steel pots seem to be the best containers.

#### Session on Welding and Tool Tempering

The first technical session of the convention held Monday morning was of a decidedly general nature so far as the subjects discussed were concerned. Out of five papers scheduled for the meeting, only three were presented.

#### Oxy-Acetylene Welds

The subject of oxy-acetylene welds was discussed by J. R. Dawson, research metallurgist Union Carbide and Carbon Research Laboratories, Inc., Long Island City, N. Y., under the title "Metallography and Testing of Oxy-Acetylene Welds." Starting out with the statement that welding is a metallurgical operation, the author mentioned among the important factors—the method of operation; the selection of men with special regard to their honesty, patience and dexterity; the training of the welder, which he emphasized as very important; and the supervision of the operation, which he pointed to as vital.

The welding of low-carbon steels was reported as now applied to water, oil, gas and steam pipes, even high-pressure steam pipes. Analyses of various rods used and photomicrographs of some of the welds which are now being obtained were thrown on the screen. The author particularly emphasized that weld metal as now produced is not a casting. The paper also discusses manganese welding and the conditions under which it can be successfully carried out, and also takes up the subject of cast iron welding. Oxy-acetylene welding, said the author, is a dependable process if conducted by dependable men, but a knowledge of metallurgy and heat treating is necessary. The author's conclusions were as follows:

It has been the purpose of this paper to point out briefly some of the applications of welding and to emphasize the dependability of the process. A study of the rapid growth of welding and the increase of its application leads to the conclusion that the opportunities it offers for increased industrial efficiency are great.

A knowledge of metallurgy and heat treatment is necessary for proper understanding of the art, and members of this society are especially fitted to appreciate the fundamentals of welding and its application to individual plants. It has been pointed out many times that actual loss results from failure to take advantage of the opportunities offered by this society to aid in keeping pace with progress in heat-treating knowledge and methods, and in the same way it is

unquestionably true that present-day industries can ill afford to neglect the savings offered by modern welding methods.

Although it is true that heat treaters might well make greater use of welding, to an even greater degree the welding industries are in need of the interest and advice that you gentlemen are able to give, on account of your knowledge of the action of metals under high temperatures.

Replying to a question as to what is the thickness of metal which can be welded, the author stated that in his opinion there is no limit except as a matter of economy and cost. The cost of welding of an article probably increases as the cube of the area that must be filled in and it is, therefore, a matter of volume, with each job presenting a problem of its own. There is also the matter of the comparative cost of a new part in place of the one to be welded.

#### Furnaces and Fuels

"Some Observations on Furnaces and Fuels, Including the Electric Furnace for Heat Treating," was the subject of a paper by E. F. Collins, consulting engineer General Electric Co., Schenectady, N. Y. It was presented in abstract by the author. This paper, as well as the preceding one by Mr. Dawson, was not pre-printed.

The paper, which the author characterized as largely a word picture and one which does not lend itself to adequate abstracting, was only briefly outlined. Mr. Collins pointed out the fact that the selection of a furnace is largely influenced by the promoter, but that engineers should make the selection. Furnaces in general, whether electric or fuel, are fitted to processes, and not processes to furnaces. The author seemed to favor the metal resistor type of furnace for heat treating, which with capable handling and management was emphasized as an efficient unit. While the human element may often modify results, the control which is possible and the evenness of temperature which can be obtained are important factors. There are, however, many cases where the author has found that a fuel furnace is sometimes better adapted to the conditions prevailing.

In reply to a question as to what cost one could pay for electric current so as to operate an electric furnace economically as compared with gas, Mr. Collins said that one of the objects in writing his paper was to prevent the asking of just such a question, which he admitted was a difficult one to answer. However, he said that the last question that one should ask in choosing as between the electric furnace and any other type is the question of the relative cost of the B.t.u. developed electrically and by fuel, because there are so many other considerations usually met with whose economic value is very much greater than the relative cost of the B.t.u. generated electrically as compared with fuel, that is, taking average values.

Another member asked the author whether a heating arrangement has ever been made that will take small voltages for forgings. Answering this, Mr. Collins said that in the past he had operated electric furnaces in which billets were heated to about 1200 deg. C., but this furnace was a carbon type of resistor which had not proved satisfactory. When it comes to applying the electric resistor to a forging proposition under conditions as they exist today, Mr. Collins said that "we are not quite ready yet to talk about that matter."

#### Tempering Tool Steels

An interesting paper on tool steels, entitled "The Tempering of Tool Steels," was presented by J. P. Gill, co-author with L. D. Bowman, both metallurgists of the Vanadium Alloys Steel Co., Latrobe, Pa. Mr. Gill prefaced his presentation with the statement that this paper was presented in part before some of the Northwest chapters of the society early in January, and, because of the general interest shown at that time, the authors' experiments have been carried somewhat farther and were embodied in this paper.

The paper is largely a study of the effect of time, temperature, and mass on the tempering of tool steels, including high-speed steel. The authors show that

tempering colors are dependent on time, as well as temperature, and that all tempering colors can be produced on the surface of a piece of steel successively at low temperatures, 250 to 300 deg. Fahr., if held a sufficient length of time. The time element, however, is less effective, the higher the drawing temperature. The authors have found that mass has only a small effect upon the rate of tempering, and that molecular re-arrangement takes place in hardened steels at atmospheric temperatures, the speed of which increases with the temperature, but is not proportional to the temperature.

The authors have also shown in the paper that the first measurable degrees in hardness take place in a 1 per cent carbon tool steel at a temperature of about 275 deg. Fahr. when tempered for a length of time not greater than 2 hr. The same is true for a number of light alloy tool steels. As the percentage of carbon and alloys increases, it requires a proportionally higher temperature to soften the steel until in high-speed steel tempering within a certain range actually increases the hardness of the steel. They also state that the specific gravity increases and the volume decreases with the tempering of carbon and light alloy tool steels. A number of tempering diagrams are given in the paper from some standard types of tool steels. High-speed and tool steels should be slowly cooled from the tempering temperatures. Quenching from these temperatures will, however, produce some brittleness. The paper also includes a short discussion of the phenomena of "temper brittleness" as it refers to tool steels.

#### Cobalt Steel

In the discussion, the question of cobalt steel, as compared with 18 per cent tungsten steel, was brought up with particular reference as to whether there was a difference in the drawing between the regular tungsten and the cobalt steels referred to, to which Mr. Gill replied that there is very little difference between the high-tungsten and the cobalt steels; in other words, one figures upon the same drawing for both.

A. H. D'Arcambal stated that the authors have shown clearly that the type of tool steel containing 1.25 to 1.50 per cent tungsten resists tempering no better than does the plain carbon tool steel. He added that it might be of interest at this point to state that some small tool makers have recently put on the market taps made of this low tungsten tool steel, and have called them "semi-high-speed" steel taps. The speaker characterized this as a misnomer, because they have absolutely no more high-speed properties than does a plain carbon tool steel. Besides this, many of these low tungsten tool steels contain also about 0.50 per cent chromium, which means that the steel will resist tempering at a lower temperature than the plain carbon tool steel.

H. J. French, Bureau of Standards, Washington, expressed his interest in Mr. Gill's paper, and assumed that the authors had used in all cases a hardening practice similar to that which is the usual custom. However, he felt that it was desirable to state that the characteristics of the hardness tempering temperature curves for tool steels are largely dependent upon the original hardening treatment given a steel of a given composition and a given size. He cited as an example that a 1 per cent carbon steel, which is hardened from a temperature such as is customarily used, may show a decrease in hardness with rise in tempering temperature, but if that steel is heated to a high enough temperature and then quenched, one may get an increase in hardness with a rise in tempering temperature. Mr. French also asked the author whether in his experience he has found that the slow cool or the quench gives the highest impact value, and whether the question is not yet settled. In reply to this, Mr. Gill stated that the investigation was absolutely in the field of tool steels and that it had not gone into structural steels or the alloys. In the field of tool steels, all those which could be made file hard by ordinary hardening methods did show that they were more brittle by quenching from the tempering temperatures.



W. J. Merten, chairman of the Pittsburgh chapter, presided over this meeting.

### Session on General Subjects

The paper, "Investigation of the Treatment of Steel for Permanent Magnets," by R. L. Dowdell, instructor in metallography, University of Minnesota, Minneapolis, scheduled for the technical session of the morning of Oct. 9, was presented on Friday morning. It was not pre-printed. In this paper the author deals with the various treatments to give the greatest permanence to tungsten, chromium, cobalt-chrome and various magnet steels. The apparatus for testing bar is explained and open circuit coercive force, a new type, is compared with the usual or closed circuit coercive force. Curves are given for the magnetic saturation of these steels and the effect of drawing temperature on the remanent induction and coercive force of hardened bar magnets is shown. There is a smaller percentage of loss of remanent induction in magnets with a high than those with a low coercive force when the bar is subjected to impact forces. Natural and artificial ageing curves for 17 different treatments are given and it is pointed out that magnets should have the highest possible scleroscope hardness without cracking. The results show that the magnets giving the greatest permanence were those which had a treatment of a draw at 100 deg. C. for about 10 hr., then magnetized and quenched 10 times in ice water from boiling water.

Other papers presented at this session, of which Paul D. Merica, research department, International Nickel Co., New York, was chairman, were "Protective Coatings for Selective Carburization," the joint effort of J. S. Vanick, metallurgist, and H. K. Herschman, assistant physicist, Bureau of Standards, Washington; "The Physical Properties of Metals at Elevated Temperatures," by Vincent T. Malcolm, metallurgist, Chapman Valve Mfg. Co., Indian Orchard, Mass.; "The Seasoning of Steel," by W. P. Wood, department of metallurgy, University of Michigan; "Conical Illumination in Metallography," by H. S. George, Union Carbide & Carbon Research Laboratories, Inc., Long Island City, N. Y.; "Carbon and Carbon-Vanadium Steel Castings—A Comparison," by J. M. Lessells, mechanical engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh and "The Theory in Quenching Steels," by Kotaro Honda, Tohoku Imperial University, Sendai, Japan. The last paper was presented by title only. Discussion of the several papers was limited by reason of a plant visitation scheduled for noon.

#### Selective Carburization

The paper of Messrs. Vanick and Herschman details that, in a search for an effective protection of steel surfaces from carburization, coatings of copper plate and mineral base pastes, such as fireclay, kaolin and enamel mixtures were experimented with. Copper plate is known to provide an effective protection, but it is subject to defects inherent in electro-deposits. These defects are most readily overcome by increasing the thickness of the coating. The thickness of plate necessary to protect surfaces against carburization was determined for comparatively long exposures and the methods employed were somewhat more thorough than those hitherto recorded. The data so obtained are shown in a chart and expressed by empirical curves for coating thickness and plating time. Of the mineral base coatings, a thin coat of the enamel ground and a thick coat of a fire clay sodium silicate paste provided moderately satisfactory protection. The ease with which the former is applied and the slightly better protection which it offered add to its points of merit. Microscopic evidence of nitrogen contamination and cementite concentration prompted a search for the source of the former and led to a discussion of the latter. An infiltration of nitrogenous gases through the protective coatings apparently caused the nitrogen contamination, although the decomposition of a nitrate was held responsible for similar effects in the specimens coated with the enamel mixture.

W. P. Wood in his paper detailed the results of a year's seasoning of carbon, nickel, chrome-nickel, chrome-vanadium, silicon-manganese and high-speed steels, which showed a loss in tensile strength, but increases in elongation and in reduction of area. Mr. Wood stated that he had not arrived at definite conclusions because of a desire to pursue investigations further.

#### Conical Illumination

Mr. George presented lantern slides showing the effect of light rays from different angles and was complimented by speakers on having opened up a new field of micro-photography, which supplements and extends the results hitherto attained by prisms and the silvered mirror in the deflection of rays upon the material to the photo-micrographed. A full abstract of this paper will be published in a later issue of THE IRON AGE.

### Session on Forgings

The essential features in the production of heat treated forgings, more particularly those used in locomotives, were discussed in a paper on the "Manufacture of Heavy Forgings" by W. R. Klinkicht, foreman, heat-treating department, Pollak Steel Co., Cincinnati, presented at a technical session on heavy forgings, at which J. J. Crowe, metallurgist, Navy Yard, Philadelphia, was chairman. The meeting room adjoined the exposition floor and notwithstanding the handicap of the noise occasioned by the demonstration of adjacent machinery, Mr. Klinkicht's paper was received with evident interest.

The great responsibilities resting on the successful performance of railroad or ordnance forgings was emphasized, as well as the necessity for taking every precaution to produce sound homogeneous forgings capable of withstanding the terrific shocks and stresses incident to their daily use. Heavy forgings are made of open-hearth steel, usually basic, whether of plain or carbon alloy. For straight carbon steel the carbon range differs. The American Railway Association has adopted a standard of 0.38 to 0.52 per cent carbon, 0.40 to 0.70 per cent manganese, with phosphorus and sulphur under 0.05 per cent. Other specifications, it was said, will classify the forgings by size, in which case the carbon range of 0.38 to 0.52 per cent will be acceptable for forgings up to 7 in. in diameter, a range of 0.45 to 0.60 per cent being required for larger sections.

#### Alloy Forgings for Locomotives

That the demand in recent years for increased strength and less weight has brought alloy steel into prominence was pointed out, and it was said that the railroads are slowly incorporating these steels in their equipment. "Alloy steels are here to stay," said Mr. Klinkicht, "although only a few of those made today are used to any extent in locomotive forgings. Of these alloys, the chrome-nickel, chrome-vanadium and carbon-vanadium are probably the most popular, and they are used mainly for reciprocating parts. A few roads have extended their use to the driving and trailer axles and there seem to be indications that the alloys will gradually displace the carbon steel for locomotive forgings."

To bring out the best qualities of an alloy steel, oil quenching and tempering was recommended, although some forgings are furnished normalized and annealed, especially carbon-vanadium. Where an alloy steel is used the percentage of alloy is, it was said, kept within its lower limits, and, with one exception, carbon-vanadium, the carbon is generally reduced when another alloy is present.

The work of the testing departments of the railroads was outlined and these departments were said to be of benefit to both the manufacturer and the railroads, because they are usually in charge of a competent metallurgist who is in a position to see that material of good quality is not handicapped by improper design or faulty machining, as most forgings are finished in the shops of the railroad company. The need



for utmost care in the machine finishing operation was emphasized.

Essential factors to be considered in applying steel for forging were reviewed and the operation of forging described. Forgings pressed directly from ingots were said to be superior to those forged from blooms, because of deeper and more uniform penetration characteristic of press performance, and the more accurate control of the heating possible in the forge shop. The ingots are usually of the sand cast, corrugated type, the smallest about 18 in. in diameter and weighing 7 tons. It is not commercially practical to forge the smaller material from ingots and for this class blooms or billets are used. The examination before forging of ingots, blooms and billets for surface defects, and the chipping out of these defects, were outlined.

The need of close attention and skilled operators in the heating of ingots for forging was emphasized, the heating for forging being said really to be the beginning of the heat treatment of the steel, the factors considered in the heat-treating operation being just as applicable to the forging. Tests and charts used to determine accurately the length of time necessary to heat the steel thoroughly were shown and discussed. After thorough heating the ingot is removed from the furnace by a crane and placed under the press for the breaking down operation, which begins in the center. During the forging the scale is constantly blown off the steel and the dies kept clean so that none of it is pressed into the forging. The temperature at which the forging has been finished was said to have as important a bearing on the final structure of the steel as the maximum temperature to which the steel has been heated, and it is always desirable to have the forgerman finish as near the upper critical range of the steel as possible. The finishing temperature, it was emphasized, will also have considerable influence on the success of the final heat treatment. On completion the forging is laid on a cinder bed for cooling, after which it is removed to the saw bay for sawing to length. Hollow boring, when specified, precedes the heat treatment.

The forging is then annealed or quenched and tempered, according to the specification. Should annealing be specified the forging is loaded on a car-type furnace which is heated by oil burners so arranged as to permit of uniform heat distribution throughout its length. Here again factors of time, temperature, mass and surface play their part, as not only most complete grain refinement takes place, but certain physical qualities must be brought out. To relieve forging strains and break up pre-existing coarse grain structure, the forgings are normalized and annealed, which will require about 24 hr. for forgings about 12 in. in diameter. For 0.40 to 0.50 per cent carbon steel a normalizing temperature of 1550 deg. Fahr., followed by an anneal at 1100 to 1200 deg. Fahr., will give excellent results, unless the steel has been overheated in the forging operation, when a normalizing temperature of 1650 to 1700 deg. may be necessary.

For quenching and tempering of large shafts vertical furnaces with special loading facilities are employed. They are oil fired by means of bull type burners arranged so that the flames swirl around the forging without impinging directly on it.

The heating preparatory to quenching is probably the most important operation in the thermal treatment of steel and especially so for large sections. After numerous experiments with quenching baths a soluble oil was finally adopted. With this oil a fairly high elastic limit was said to be possible without the attendant danger of water quenching.

After treatment tensile and, if specified, bend tests are taken from a full size prolongation left on about 20 per cent of the forgings, one being selected at random from a furnace charge. A proof test follows this.

#### Other Subjects

An abstract of a paper on "Some Fundamental Defects of Hardened Steels," by Dr. Leslie Aitchison, Birmingham, England, was read at the forging session by R. T. Bayless, editor of the *Transactions*. This paper is concerned with certain properties of fully

hardened steels that can be regarded only as defects, being defects in the sense that the steels would be better if they did not possess these properties. Two such "defects" are dealt with in the paper, these being (1) the abnormally low value of the limit of proportionality, or what is often called the elastic limit, and (2) the instability of volume which characterizes the hardened steels.

The "Process of Transparent Metallography" was the subject of a paper read by L. V. Foster, Bausch & Lomb Optical Co., Rochester. "Determining Heat Treating Costs," by H. F. Wood, metallurgist, Wyman-Gordon Co., Ingalls-Shepard division, Harvey, Ill.; "Practical Heat Treatment of Carbon, Alloy and High-Speed Steel Tools," by J. J. Jones, metallurgist, Pittsburgh, and "Spark Testing of Steel," by Don Stacks, consulting metallurgical engineer, Hartford, scheduled to be read at the forging session, were presented by title only.

### Symposium on Hardness Testing

Beside the scheduled papers at the technical session held at Motor Square Garden on Thursday afternoon, with Maj. A. E. Bellis, Bureau of Standards, Washington, D. C., chairman, E. G. Herbert, Manchester, England, described his pendulum hardness tester, both by word and lantern slides, and gave a practical demonstration of the instrument. This was described in THE IRON AGE, May 31, 1923.

#### Hardness and Magnetic Tests

The hardness testing symposium proper started with a discussion of the paper of A. V. deForest, research department, American Chain Co., Bridgeport, Conn., on "Magnetic Indications of Hardness and Brittleness." In this paper the author details the magnetic effects of the different elements of a heat treatment on 18 per cent tungsten high-speed steel, with specimens  $\frac{3}{8}$  x  $\frac{3}{8}$  x 3 in. The hardness and brittleness magnetic measurements were plotted respectively along two axes at right angles to each other and these factors are expressed in terms of quenching and drawing temperatures. One of the outstanding results of the work so far is the great variation encountered in heat-treated specimens, even when made from the same bar of stock. If a group of 10 pieces is hardened from 750 to 800 deg. C., instead of these forming two groups, they will almost invariably form nearly a continuous series from one minimum to one maximum specimen. From this series samples can be selected for test to show the differences to be regularly expected. Conversely, the differences between the different specimens of the same stock and supposedly the same heat treatment give a logical measure for the improvement of the whole heat-treating process. Magnetic tests can be applied to the raw material from which tools are made, and its suitability of structure and physical state determined. Tests on the finished product can prove the acceptability of the tool and indicate which step is at fault in the heat treatment. As in the case of analogous mechanical tests, differences of size or material will produce results which cannot be interpreted without reference to service tests. This means that after the testing apparatus is at hand a period of investigation is necessary to interpret the findings into terms of service.

In the discussion of this paper it was brought out that the magnetic test was not applicable to non-ferrous metals because they were nonmagnetic; also references to hysteresis, the magnetic shakeup, with the breaking down in the cohesion of the fibers and the changes in dimensions.

#### How to Use Different Machines

H. M. German, metallurgist, Henry Disston & Sons, Philadelphia, in his paper, "Testing Steels for Hardness," undertook through a recitation of tests to answer the question, "Would it not be possible to formulate some instructions as to how to use the different (hardness testing) machines?" He discusses the Brinell, Rockwell and scleroscope machines and deals with the elements and factors that introduce errors in their operation. A variation in reporting Brinell hardness, the

author states, is a good reason for standardized practice. It is pointed out that gage limitations of specimens to be tested by the Brinell method are influenced by the hardness of the specimen, noting the slighter impression in a thin section of high tempered than low tempered steel. An impression which shows on the opposite side will not give accurate results and should be discarded. The speed of the application is one avenue of error, since the impression is greater if the application is rapid than when it is slow and gradual. Tendency of the steel balls to crack or become deformed he characterizes as a weakness of the Brinell machine. The author defines the uses and limitations of all three machines and concludes that all three are valuable in their own particular fields. He suggests as a means of interchangeability of terms of the three machines the preparation of a series of test pieces of the same gage and finish and the taking of readings with the different machines and the plotting of a curve which will show direct comparison of the readings.

#### Hardness of Sheet Brass

"The Hardness of 'Common High' Sheet Brass," the contribution of Alvan L. Davis, metallurgist Scovill Mfg. Co., Waterbury, Conn., to the hardness testing symposium referred to commercial sheet brass of an approximate composition of 66 per cent copper, 33½ per cent zinc and ½ per cent of lead, iron and other impurities combined, and set forth the average hardness as determined by various methods as well as the range of hardness to be expected in annealed and hard-rolled sheet brass of quarter hard, half hard, hard, extra hard and spring tempers. The hardness of brass is not developed in the same way as is generally the case in steel, hardness in brass of a given composition being due to cold work, together with the degree to which such work has been relieved by annealing. In annealed brass its previous history, as to annealings and as to the stages and amounts of cold-rolling, exerts a notable influence on the resulting hardness. Interesting figures of the various hardness tests are presented and the variations, the mean hardness and the per cent of reduction by cold-rolling. The author finds merit for all of the testing appliances, the Erichsen cup, Shore universal and magnifier hammer, Rockwell and Brinell, within certain fields.

#### Session on Sheet Steel

One of the afternoon sessions, that of Monday, was devoted to sheet steel. This session was presided over by J. Weaver Smith of the Indianapolis chapter, in the absence of W. H. Harper, originally designated as the chairman.

#### Annealing Sheet Steel

A paper entitled "The Annealing of Sheet Steel," by Francis G. White, metallurgical engineer National Enameling & Stamping Co., Granite City, Ill., was presented by A. W. F. Green, metallurgist John Illingworth Steel Co., Philadelphia, in the absence of the author. The paper discusses the annealing of low carbon sheet steel from the mill standpoint, and also takes up the problem of grain growth caused by a slow cooling rate from the annealing temperature, the phenomenon being illustrated by photomicrographs.

The complexity of sheet steel annealing will be realized, says the author, when it is recalled that at times as many as 40 tons of sheets are placed in one furnace. He points out that the heat must be driven through an annealing cover, as well as a blanket of air or gas surrounding the sheets, and then actually distributed throughout a mass of steel probably 3 or 4 ft. thick. While at this temperature as much air as possible must be excluded, the material cannot be exposed to the air until it is cooled, otherwise severe scaling of the sheets results. Slow cooling from this temperature is ideal for grain growth. If the sheets were heated to the upper critical range, says the author, it would be impossible to open or separate them, because of "sticking," even though the cooling time could be shortened. The author also includes in the paper a discussion of various furnace designs,

temperature curves and stamping tests, and the general practice used in one plant is briefly discussed.

In reply to a question by the chairman as to whether such sheets can be annealed in a continuous conveyor type of furnace in the form of single sheets, J. H. Nead, metallurgist American Rolling Mill Co., Middletown, Ohio, replied that they can be so annealed, but that the chief objection is the cost. In annealing sheets, he said, a low cost must be obtained, although the process referred to is being carried out in some cases. There is the advantage in the continuous conveyor method that when you anneal by that process the annealing can be carried on more nearly at theoretically correct temperatures. In box annealing, it is impossible to anneal according to the constitution diagram, because, as already pointed out, if the proper temperature were maintained the whole pile would remain stuck together.

The question of the difference between Bessemer and open-hearth steel was brought up, particularly as regards sticking, to which Mr. Nead replied that such a comparison was hard to make, because it is customary to put phosphorus into steel for sheets to enable them to be opened after the hot rolling. Of course, Bessemer steel is very satisfactory for that purpose, said Mr. Nead. He also said, in response to a question as to whether a high percentage of silicon is put into the steel for the same purpose, that most soft steel sheets are made without silicon.

#### Annealing Sheets Electrically

Another member asked whether it would be possible to anneal a large batch of sheets in an electric oven economically, thus eliminating the need of a protective covering, because of the presence of a neutral atmosphere. Mr. Nead again replied that his company had done nothing along that line, but that it would depend upon the cost of current as to whether it could be done economically. A member of the Westinghouse company volunteered the information that they have had some experience in annealing sheets without boxes in a muffle furnace, and that a great deal of trouble had been experienced in keeping the oxidation to a minimum, although the problem was simplified because of the high silicon content of the steel. Referring to the question of annealing sheets in an electric furnace, with the heat applied on all sides, the same authority stated that the therm conductivity of sheet steel is very low in a direction perpendicular to the laminations. Another reason for not using this method is that when the furnace is opened one would have a considerable number of electrical connections to be removed, which would be a disadvantage.

#### Automobile Sheet Specifications

The other paper presented at this session was entitled "Automobile Sheet Steel Specifications," by H. M. Williams, metallurgist General Motors Research Corporation, Dayton, Ohio. Mr. Williams in his paper pointed out that the developments of specifications for the inspection and test of automobile sheets is occupying the attention of many metallurgists and engineers, and that the demand has at least equalled the supply. Because of this, a postponement of standardization of this important automotive material has been necessary. Very great losses in unusual stampings and in labor to repair defective ones have resulted from unsuitable material, defective forms, and improper die construction. It is, therefore, a question of finding a quality of sheet that will produce the desired part in a certain die, which often makes it necessary for some sheet mill to produce a new quality of sheet. The author pointed out that at the present time one sheet mill is producing over 50 different kinds of sheets varying in surface finish and temper. This is the situation which results in great economic loss to both producers and consumers. Mr. Williams said that only the full cooperation of sheet mills and the autobody and parts makers can remedy this condition and standardize sheets, design and die construction.



Mr. Williams' paper, which was read from manuscript and not preprinted, then takes up various phases of the problem, such as the question of the gage of sheets, the difficulties encountered in the production and utilization of sheets, their surface inspection, stretcher strains, grain size, scale, and other matters. He concluded by reading extracts from a copy of the tentative specifications for automobile sheet steel of the General Motors Corporation, which he offered as a basis for discussion and criticism. There was, however, no discussion of this paper.

### Round Table Meeting on Standards

The only round table discussion was held Tuesday afternoon, Oct. 9. It resolved itself into an informal meeting under the direction of the standards committee of the entire organization with R. M. Bird, chief metallurgist, Bethlehem Steel Co., Bethlehem, Pa., as chairman. The object of the meeting was to obtain an expression of opinion from various members on certain activities of this national committee. The committee's chairman, Mr. Bird, delivered a brief address covering some of the work of the committee in the past year, and outlined some of the subjects which it had under consideration, such as recommended practice; limits of heat treatment, including a plea for preferential attention for work for which there is a demand; the work of the committee as a clearing house, which should also act as a judiciary committee. Among other things he suggested that a paid secretary should be appointed.

Two matters of prime importance, which he said were uppermost in the present work of the committee, were data sheets and heat treatment definitions. Discussing the latter subjects, various members informally gave their views as to the meaning of certain heat-treating terms, particularly annealing, taking this term as one typical of present misunderstanding in the steel industry in general. It was pointed out that this term carries various meanings in various localities,

and the necessity for general accord as to a definition of this particular term was emphasized. It was pointed out that other societies, such as S. A. E. and the A. S. T. M., have certain interpretations of this heat-treating process, and the question was brought up as to whether the steel treaters should take up the task of developing not only a standard definition for annealing but a standard set of heat-treating terms. Hugh Tieman, Pittsburgh, pointed out the variety of meanings of the term "annealing" and was in close accord with the general sentiment of other speakers. A suggestion made by A. H. D'Arcambal that a committee be formed made up of those using annealing processes, this committee to formulate a definition for further discussion, met with general approval.

The remainder of the meeting was taken up with reports of four sub-committees of the standards committee. F. E. McCleary, metallurgical engineer Dodge Brothers Co., Detroit, delivered an interesting report of progress for the sub-committee on the treatment of steel. The report of the sub-committee on pyrometry was published in the September issue of the *Transactions* under the authorship of J. H. G. Williams, chairman, and was pointed to as a splendid step forward. The report of the sub-committee on the treatment of case hardening steel was given briefly by R. J. Allen, metallurgist Rolls Royce Co. of America, Springfield, Mass., chairman of the committee, who reported progress on work not yet fully completed, this work including a study of the efficiency of various carbonizing materials and a study of methods of measuring the depth of case. It was pointed out that the paper delivered at the carburizing session Tuesday morning by S. R. Rockwell represented part of the work of the committee. The committee on the heat treatment of tool steel, of which W. J. Merten was chairman, was referred to by Mr. Merten, as published in the September *Transactions*, and as containing recommended practice on the heat treatment of plain carbon tool steel and recommended practice on the heat treatment of 18 per cent tungsten high-speed steel.

## The Steel Exhibition an Impressive Display

THE comprehensiveness and expanse of the exhibition this year probably exceeded the expectations of the most enthusiastic steel treater. The attendance of members, guests and residents was the greatest in the history of the organization, the evening crowds being unusually large. On the last evening the largest number ever housed in Motor Square Garden was in attendance. This enthusiasm was stimulated by the inauguration of a "steel week" in Pittsburgh with small exhibits of many of the steel companies in the show windows of the large stores and with a prize competition for essays on steel among school children.

In floor space occupied, this year's exhibition was about 50 per cent larger than the one at Detroit last year. The entire floor space was about 75,000 sq. ft. taken by about 140 exhibitors against 55,000 sq. ft. used by 100 exhibitors a year ago. Actual floor space contracted for was 30,000 sq. ft. against 20,000 sq. ft. at Detroit. It is the first time that in an exhibition at Motor Square Garden all the space had been taken before the exhibition opened.

Heat-treating equipment of all kinds; stainless and non-corrosive alloys; machine tools; displays by steel companies; electric, gas and oil furnaces in operation were some of the outstanding features. A general account of some of the leading exhibits follows.

### Extensive Exhibit of Machine Tools

A wide variety of machine tools, including production units, was on view. In the space of the Motch & Merryweather Machinery Co., Pittsburgh, several machine-tool companies exhibited, the machines being for the most part under power and demonstrated by manufacturers' representatives. The Cincinnati Milling

Machine Co., Cincinnati, had a No. 4 high power vertical miller in operation, and also its No. 2 universal high power miller with new rectangular overarm. The new Cincinnati centerless grinder, in operation on piston pins, drill rods and shackle bolts, was a center of interest. A Cincinnati 12 x 18 in. universal cylindrical grinder and a No. 1½ universal tool and cutter grinder, with an exhibit of cutters capable of being ground on the machine, were also shown. The No. 10 automatic surface grinder of the Blanchard Machine Co., Cambridge, Mass., equipped with magnetic chuck, continuous-reading work gage and new wheel dresser was in operation, and the Bullard Machine Tool Co., Bridgeport, had a 36-in. vertical turret lathe in operation. Tools shown by the American Tool Works Co., Cincinnati, included a 6-ft. plain radial drill in operation on armor plate, a 3-ft. radial drill, a 14-in. tool room lathe and a 24-in. heavy pattern lathe driven by a 20-hp. motor and turning a chrome-nickel spindle forging.

Other exhibits in the space of the Motch & Merryweather company included a 32-in. shaper of Gould & Eberhardt, Irvington, N. J., and a No. 121 drilling machine of Baker Brothers, Toledo, Ohio, both in operation. The latter machine is essentially a production unit and new features included a foot treadle for engaging the feed, in place of the usual handle under the tripping box. The Giddings & Lewis Machine Tool Co., Fond-du-Lac, Wis., had its No. 32 horizontal boring, drilling and milling machine in operation, and the Ransom Mfg. Co., Oshkosh, Wis., had a tool grinder and a snagging grinder on view. A No. 13 Natco 16-spindle drill with tapping attachment and rotating table, and a No. 30 Natco 12-spindle drill, with 25 in. diameter head, automatic electric rapid traverse, tapping and spot facing attachment and rotating table, were exhibited in operation by the National Automatic Tool Co., Richmond, Ind.



The Keller Mechanical Engineering Corporation, Brooklyn, N. Y., exhibited a new automatic die cutting machine in operation on a forging die. The capacity is for dies up to 48 x 24 in. and push button control is a feature. The features of the No. 2½ inclinable press shown by the V & O Press Co., Hudson, N. Y., included the double length slide, special finger safeguard and press clutch. The Warner & Swasey Co., Cleveland, demonstrated its 3A turret lathe in operation on a 15-in. diameter, 140-lb. locomotive stoker casting. The McCoy-Brandt Machinery Co., Pittsburgh, exhibited several machines from stock, including 17-in. Sidney geared head and cone head heavy pattern lathes in operation, a 16-in. cone head, standard pattern, and a Kelley 24-in. shaper.

Machine tool manufacturers were also represented at the booths of the Laughlin & Barney Machinery Co., Pittsburgh. Among these were the Hendey Machine Co., Torrington, Conn., which exhibited its No. 2-G universal milling machine in operation, and its 1922 model lathe with all attachments. A No. 25 24-in. high duty drill of the Foote-Burt Co., Cleveland, was on view. The Avey Drilling Machine Co., Cincinnati, exhibited a No. 1½ high-speed drill in operation, and a three-spindle machine, No. 2 size, having one spindle automatic, one semi-automatic and a third hand operated. A No. 3 single-spindle machine with power feed was also shown. The 32-in. Dreadnaught shaper of the Ohio Machine Tool Co., Kenton, Ohio, was on view, and automatic drill pointers in two sizes, and a die making machine for sawing, filing and lapping operations were shown by the Oliver Instrument Co., Adrian, Mich.

The Oilgear Co., Milwaukee, demonstrated a 6-ton broaching and assembling press. High speed steel ground thread taps, internal micrometers and other gages were shown by John Bath & Co., Worcester, and collapsible taps by the Murchey Machine & Tool Co., Detroit.

#### Sawing, Welding and Other Equipment

Several metal sawing machines were shown in actual operation. A 6 x 6 in. hack saw with automatic feed of work, Nos. 1 and 2 Marvel hacksaws, a metal cutting band saw, showing application to tool room work, and its No. 23 hand-operated punch, shear and bender were exhibited by the Armstrong-Blum Mfg. Co., Chicago. The Racine Tool & Machine Co., Racine, Wis., had its No. 5 high-speed 6-in. capacity machine, No. 01 Jr. high-speed machine, and its No. 14 band saw in operation. Its 6 x 6 in. and 18 x 13 in. motor-driven universal shaping saws, the latter having improved features, and a new gap saw were exhibited by the Peerless Machine Co., Racine, Wis. In addition to a broad line of metal cutting and other saws, E. C. Atkins & Co., Indianapolis, exhibited its 8 x 8 in. Kwik Kut hacksaw and No. 3 metal cutting band saw. Henry Disston & Sons, Inc., had inserted tooth milling and other saws on view and a Higley milling sawing machine in operation. An impressive display of saws was that of the Hunter Saw & Machine Co., Pittsburgh, which exhibited a large variety of metal cutting circular saws, including large inserted tooth saws. Inserted tooth grinders and a new friction disk knurling device were also shown.

Among welding and cutting equipment exhibitors was the Air Reduction Sales Co., New York, which featured its radiograph for use in cutting plates and structural material. Automatic operation is a feature. Its camograph for production cutting of small work was shown roughing out racks from 1-in. stock. A full line of torches, tips, regulators and other material, including a new cutting gas, "Calorene," were also on view. Welding outfits in operation and a wide exhibit of oxy-acetylene equipment were shown by the Linde Air Products Co., New York. The Federal Machine & Welder Co., Warren, Ohio, exhibited its standard power drive spot welder in operation and its new No. 70 butt welder, in which slides that formerly gave trouble in alinement have been eliminated.

Other machinery exhibits included nine sizes of riveting machines and its model A 50 sensitive bench drill press shown in operation by the High Speed Hammer Co., Rochester. Henry Pels & Co., New York, punch-

ing and shearing machines, was represented and the National Machinery Co., Tiffin, Ohio, bolt and nut machinery, had a booth. A Berwick electric rivet heater and two rod heaters were in operation at the booth of the American Car & Foundry Co., New York, and the R. G. Haskins Co., Chicago, displayed its flexible shaft equipment and portable grinders. A wide variety of gears, including a heat-treated quenched and tempered gear 9 ft. in diameter, was featured by the R. D. Nuttall Co., Pittsburgh.

Sand blast equipment was shown in operation by the Pangborn Corporation, Hagerstown, Md., and its 2A metal washing machine, featuring the revolving wash arm, was exhibited by the Crescent Washing Machine Co., New Rochelle, N. Y. The Spencer Turbine Co., Hartford, showed two sizes of its turbo-compressors for blowing oil and gas furnaces, and the Pennsylvania Pump & Compressor Co., Easton, Pa., had a straight-line compressor supplying air for the Pangborn exhibit.

In material handling equipment Crescent tractors, platform trucks, Plimpton hand lift trucks and a Drake 1-ton electric hoist were among the items shown by W. E. Hamilton & Associates, Pittsburgh, who exhibited also Macleod furnaces, torches and sand blast equipment. An Elwell-Parker crane truck of 3000-lb. capacity was exhibited by the Frank B. Ward Co., Pittsburgh.

#### Heat-Treating Furnaces in Operation

Heat-treating furnace manufacturers were well represented, and the equipment, for the most part in actual operation, was a center of interest.

In electric equipment the Westinghouse Electric & Mfg. Co., East Pittsburgh, exhibited heat-treating units, with automatic control, melting pots, laboratory furnaces, air heaters and space heaters. Direct-heat electric heat-treating furnaces, air-drawing ovens and other units, in operation with automatic temperature control, were shown by the General Electric Co., Schenectady. The Geo. J. Hagan Co., Pittsburgh, featured a box-type electric heat-treating furnace, with metal hearth and automatic temperature control. High and low pressure oil burners of various types were also shown. Electric melting furnaces, one for laboratory use, were shown in operation by Holcroft & Co., Detroit, photographs and data of latest types of heat-treating and other furnaces being also shown. The Hoskins Mfg. Co., Detroit, featured its type FK continuous heat-treating furnace in which material is pushed through by an automatic pusher, no conveyor being used. The unit was shown in operation equipped with automatic temperature control. William Swindell & Bros., Pittsburgh, displayed photographs of its continuous type electric heat-treating furnaces and other equipment.

Tate-Jones & Co., Inc., Pittsburgh, exhibited its 164 B general hardening furnace for oil or gas, burners and automatic control apparatus. An 8 x 16 x 12-in. oil-fired, portable Mahrvel tool furnace was shown in operation by the Mahr Mfg. Co., Minneapolis, as well as a small model of heat-treating furnace employing an over-fired burner. The Bellevue Industrial Furnace Co., Detroit, had in operation a complete muffle vertical high-speed furnace, a new unit, in connection with a Geissinger automatic control valve. Oil and gas burners and high temperature fire brick were also shown. A model of its rotary annealing and heat-treating furnace, oil burners and blast gates were shown at the W. S. Rockwell Co., New York, booth. The Ryan-Austin automatic control valve, with charts of performance, was a feature of the exhibit of F. J. Ryan & Co., Philadelphia. The American Gas Furnace Co., Elizabeth, N. J., was represented.

Venturi burners for all types of industrial furnaces, a Venturi water-cooled open-hearth oil burner with automatic triple cut-off valve and universal adjusting device, portable rivet forges and ladle heaters were among the items shown by the Hauk Mfg. Co., Brooklyn, N. Y. The Surface Combustion Co., New York, exhibited high and low pressure inspirators, oil burners, and velocity burners for coke oven or producer gas. A heating medium, Lavite, for hardening and tempering,

was demonstrated by the Bellis Heat Treating Co., New Haven.

The Stewart-Bellis triple pot Lavite furnace exhibited by the Chicago Flexible Shaft Co., Chicago, was in operation hardening high-speed steel chasers and taps, standard Stewart oven furnace being also demonstrated. Two-heat-treating furnaces with 24 x 36 in. hearth, natural gas fired, were exhibited by the Combustion Utilities Corporation, New York. On one furnace a recuperator, intended to utilize the waste heat to preheat the air was installed, and savings due to recuperation were shown by indicating and recording pyrometers. Automatic temperature control was a feature, and flow meters were used to measure gas. Small melting furnaces and small hardening furnaces were also displayed. The N. C. Davison Gas Burner & Welding Co., Pittsburgh, had a furnace in operation connected to recording instruments showing efficiency of burner. Various sizes of low and high pressure burners, some in operation, were exhibited. A new type of high-speed steel furnace, featuring a waste gas preheating chamber, in which temperature can be accurately regulated, was in operation at the booth of the Dempsey Furnace Co., New York. Various oil and gas burners and the Constantator, a device for adjusting the speed of stokers, fans and dampers were also on view.

#### Large Variety of Testing Instruments

A large variety of indicating and recording instruments, metallurgical laboratory, testing and other instruments were exhibited. An exhibit which attracted attention was that of the Leeds & Northrup Co., Philadelphia, which in addition to potentiometer pyrometers, indicating, recording and controlling, and optical pyrometers, featured the Hump method of heat-treating, the equipment being in full operation actually heat-treating tools. A furnace for checking the accuracy of thermocouples was also shown. The Bristol Co., Waterbury, Conn., exhibited automatic control apparatus, indicating and recording pyrometers and thermometers, and other instruments. Automatic control apparatus, indicating and recording instruments, and its new electrical CO<sub>2</sub> meter, with recorder, were among the many items shown by the Brown Instrument Co., Philadelphia.

The Bacharach Instrument Co., Pittsburgh, exhibited CO and CO<sub>2</sub> indicating and recording apparatus, and several other items, including radiation pyrometers in operation. Automatic furnace control equipment with mercury relay as a feature, electric gas-analysis recorders and a general line of indicating and recording pyrometers and thermometers were shown by Charles Engelhard, Inc., New York. The Taylor Instrument Co., Rochester, featured its solenoid valve for automatic control of gas fired furnaces, showing also electrical pyrometers, both indicating and recording, thermocouples, and thermometers.

A new model of its large metallographic outfit was exhibited by the Bausch & Lomb Optical Co., Rochester. The microscope and illuminating system are now on a common base and can be removed without disturbing any of the adjustments. Metallurgical microscopes and accessories were also on view. E. Leitz, Inc., New York, displayed its "Micro-metallograph," an assortment of instruments including a new ore-dressing microscope, and grinding and polishing machines for preparing specimens.

The Tinius Olsen Testing Machine Co., Philadelphia, exhibited a small universal testing machine with accessory equipment, the Herbert pendulum hardness tester and a broad line of other equipment. Scleroscopes with special work holding jigs and pyroscopes were shown by the Shore Instrument & Mfg. Co., Jamaica, N. Y. The Pittsburgh Instrument & Machine Co., Pittsburgh, exhibited Brinell machines, impact testers, sheet metal testers, metallographic grinders and the Buvinger weight calculating instrument. Brinell machines, scleroscopes, a new optical pyrometer, carbon combustion train, and polishing machines were among the items of the booth of the Scientific Materials Co., Pittsburgh. The Wilson-

Maule Co., New York, demonstrated Rockwell hardness testers, and the Tapalog multi-record, multi-color pyrometer recorder, and the Steel City Testing Laboratories, Pittsburgh, showed late model Brinell machines.

#### Exhibits of Some of the Steel Companies

The Colonial Steel Co., Pittsburgh, told the story of crucible steel from pig iron to the muck bar and then through the successive stages of melting in the crucible pots through slits, showing the condition of the charge, quarter, half and the full way through melting period. The exhibit also included tool steel, forgings, die blocks, broken specimens to show fracture and hardened specimens of the company's steel grades. The exhibit of the Union Electric Steel Corporation, Pittsburgh, embraced pistons, rams, die blocks and trimmer steel in all grades.

The Firth-Stirling Steel Co., McKeesport, Pa., featured an open fireplace of stainless steel, as was the frame of the mirror above the fireplace, while a remarkable representation of the fire was made by blue chip turnings. Another feature of this company's exhibit was a display of the stainless steel in a great many forms, not the least interesting of which were golf club heads which had been in actual use for several months and still had all of their original lustre as a result of merely wiping them after use with a soft dry cloth.

The Cutler Steel Co., Pittsburgh, displayed a wide variety of uses to which Duraloy (chrome-iron), the product of this company, may be put. Deep drawn, rolled carburizing pots, seamless tubes, wire, bars, sheets, plain and corrugated, plates and numerous castings, among which was a pump impeller. The Jones & Laughlin Steel Corporation, Pittsburgh, showed cold-finished steel sections for high speed steel work; also tin and black plate samples and nails and other wire products.

The exhibit of the Bethlehem Steel Co. was an educational effort in which the materials entering the blast furnace, the coke ovens and into the manufacture of nickel chrome steel (S. A. E. series 31-30) with proportional samples of the various materials and the products.

The Central Steel Co., Massillon, Ohio, showed the process of the company in a series of photographs and transparencies and also, in action, the transmission gears of a motor car. The Witherow Steel Co., Pittsburgh, displayed sample pieces of the products possible in continuous die rolling.

The Interstate Iron & Steel Co., Chicago, featured a film showing the making of alloy steels at its South Chicago plant. It also had an automobile transmission gear in action. The exhibit included heat-treated rivets, forgings, finished automobile parts and springs.

The exhibit of the Crucible Steel Co. of America included welded high speed steel knives for wood surfacing, cracker shear blades, Reizistol standardized pipe gages and household utensils, the latter of very high ultimate strength and almost indestructible; drop forgings, including turbine blade made to a tolerance of 0.002 in., and a Rickert-Shafer collapsing tap.

The Ludlum Steel Co., Watervliet, N. Y., exhibited for the first time Delhi rustless iron, finding extensive use in automobile pump shafts, golf club heads, cooking utensils, turbine bucket blades, bolts and nuts, sheet steel gages, and templets and ball bearings; its Purple Cut line of molybdenum steel for bridge reamers and threading dies and taps; Utica oil-hardened die steels, which combine the oil-hardened non-warping features of the low carbon high manganese die steel with the cutting efficiency of the high carbon straight carbon steel; Silchrome, a heat-resisting, nonbattering, non-corrosive steel finding its principal use in valves in high priced automobiles, and Nevastane, a nonstaining, noncorrosive cutlery steel.

The Pittsburgh Crucible Steel Co., Pittsburgh, featured in its exhibit carbon-vanadium in steel for heavy forgings, the crankshaft used in the new Buick six automobile and axles of various analyses.

Molybdenum was featured by interesting displays by the Climax Molybdenum Co. and the Molybdenum Corporation of America, New York.



Besides several companies displaying stainless iron and steel, the American Stainless Steel Co., Pittsburgh, exhibited an attractive line.

Insulating brick for furnaces and ovens was among the products exhibited by the Armstrong Cork & Insulation Co., Pittsburgh, and high temperature cements for laying up fire brick settings and other uses were shown by the King Refractories Co., New York. E. J. Lavino & Co., Pittsburgh, showed chrome, magnesite and silica brick, ferromanganese and ferrotungsten. A complete display of Sil-O-Cel heat insulation, including a standard blow torch test on the brick, was seen at the booth of the Celite Products Co., Chicago. The Quigley Furnace Specialties Co., New York, showed insulating brick and the application of its Hytempite cement in building and repairing furnace walls. Refractories for use in electrical heating devices, including muffle lining and plates for use in resistance type steel treating furnaces were exhibited by the Electrical Refractories Co., East Palestine, Ohio, and refractories and furnace cements were among the products at the booth of the S. Obermayer Co., Chicago.

There were several exhibits of heat treating materials. Case hardening compounds, cyanides, quenching and drawing oils were exhibited by the Park Chemical Co., Detroit, and cutting oils, carburizers and tempering and drawing oils by E. F. Houghton & Co., Philadelphia. Cutting, drawing and quenching oils were among the products of the Dearborn Chemical Co., Chicago. The Rodman Chemical Co., Verona, Pa., exhibited case hardening materials and oils, and the Case Hardening Service Co., Cleveland, showed its Bohnite case hardening compound, Caseite, a cyanide mixture, and non-case anticarburizing paint, for localizing case hardening and for the protection of steel from absorption of carbon. Chemicals were exhibited by the Roessler & Hasslacher Chemical Co., New York, and carburizing pots and boxes by the Swedish Crucible Steel Co., Detroit.

#### Heat Resisting Alloys

A splendid display of heat resisting alloys under various trade names and in a variety of shapes was found in booths occupied by the General Alloys Co., the Driver-Harris Co., the Ohio Steel Foundry, the Calorizing Co., as well as some others mentioned above.

#### Other Details

Space does not permit detailed descriptions of some of the features of the displays of the Atlas Steel Corporation, the Cleveland Steel Tool Co., the Halcomb Steel Co., the Haynes Stellite Co., the International Nickel Co., the Midvale Co., the Pittsburgh Crucible Steel Co., the Tacony Steel Co., the United Alloy Steel Co., the Vanadium Alloys Steel Co., the Vanadium Corporation of America, the Vulcan Crucible Steel Co., and others.

An interesting booth was that of the Heppenstall Forge & Knife Co., where a novel device for testing steel balls attracted much attention.

#### The Annual Meeting

The annual meeting of the society on Wednesday morning was enlivened by a spirited discussion of the revision of the constitution and by-laws of the organization as recommended by a committee headed by S. M. Havens, Wyman-Gordon Co., Harvey, Ill., and some independent proposals, relating chiefly to the manner of selecting the nominating committee and limiting both the power and salary of the secretary, fathered by the Detroit chapter.

The apparent contradiction between articles 1 and 2 of the revised constitution provoked the suggestion that either the name of the society should be changed to harmonize with its objects or the objects should be made to conform to the name. Since the scope of the society's activities has expanded beyond the treatment of steel, not a few of the delegates favored a change of name more compatible with its present range of endeavors. There were many suggestions for new names, some of which were so high sounding as to bring out the expression that if the society was to continue to appeal to the men in the shop, the backbone of its strength, a name that sounded too imposing would keep many shop men out of the membership.

It was finally realized that an agreement on the subject was impossible and debate was terminated by a motion from the floor.

The meeting assumed a parliamentary character, when the matter of the change in the mode of electing national officers and the selection of the nominating committee, particularly the latter, came up for consideration. Motions, amendments and substitutes were made in quick succession and it was often necessary for the chairman to ask that the motion to be voted on be restated. The Detroit chapter proposals included increasing the number of directors from four to seven, a nominating committee chosen by the general membership on a numerical basis and not by presidential selection, the taking away the vote of the secretary at board meetings and the fixing of the secretary's salary at \$6,000 a year. William P. Woodside of the Detroit delegation expressed regret that Detroit proposals had created an impression that they were directed at the secretary and, upon the presentation of a motion embodying the ideas of Detroit chapter as to the selection of the nominating committee, he announced the withdrawal of the Detroit chapter's proposals.



GEORGE K. BURGESS, Director of the Bureau of Standards, Washington, the new President of the American Society for Steel Treating. Has Long Been Identified with Research in the Heat-Treating Field. The symposium on pyrometry which he conducted in 1919 for the mining engineers is only one of his many contributions to scientific advancement. Dr. Burgess last June completed a year's service as president of the American Society for Testing Materials

After much discussion, a motion which provided that the nominating committee should be composed of delegates selected by chapters, on a basis of one delegate for each 100 members or fraction thereof, to meet on the Monday of the annual convention and to be empowered to pursue the work either as a committee of the whole or by a subcommittee, was tabled. The question of expense and the ability of a large committee to agree, the unfairness to small chapters in the numerical basis of representation, all were stressed by speakers. It was finally voted to advise the committee on constitution and by-laws to devise a scheme for the placing of the committee selection in the hands of the membership and that they be elected from each chapter, with one delegate from each chapter.

#### Election of Officers

Report of the tellers of election told of the election of George K. Burgess, Bureau of Standards, Washington, as president; Robert M. Bird, Bethlehem Steel Co., Bethlehem, Pa., second vice-president; Dr. Zay Jeffries, Aluminum Co. of America, Cleveland, treasurer, and J. F. Harper, Allis-Chalmers Mfg. Co., Milwaukee, a director for two years.

President Lynch, in his address, reviewed the activities of the society during his term of office, noting a gain in membership of 18.75 per cent, the passing of the Bridgeport, Conn., chapter, but the organization of the Los Angeles chapter, leaving the society with the same number of chapters as a year ago, or 28. He commended the work of the various committees and commented upon the success of this year's convention. He said that one-third more floor area was occupied by exhibits this year than in Detroit last year and also told of the plan of meeting convention expenses from the rentals.

Report of the retiring treasurer, J. V. Emmons, Cleveland Twist Drill Co., Cleveland, showed the soci-

ety to be in an exceedingly prosperous financial condition, with a reserve of \$24,000 and income for the year ended Dec. 31, 1922, \$16,000 in excess of expenditures. He detailed the working of the budget for the first eight months of the year, showing that actual receipts exceeded the expected receipts by over \$5,000 and that expenditures were only about \$2,000 more than expectations. As of Aug. 31 last there was a surplus of \$11,406 as against \$7,977 at the end of 1922.

W. H. Eisenman, secretary, reported a membership as of Sept. 1 last of 2746, a net gain for the year of 433. He urged an increase in junior memberships, which on Sept. 1 totaled 99. He commented on the growth of the society publication and detailed the data sheets now under preparation.

R. M. Bird, general chairman standards committee, recommended that the name of the committee be changed to committee on recommended practice, and told of the need of standard definitions of heat treating terms. It was the sense of the meeting that the name of the committee be changed and the matter be referred to the committee on constitution and by-laws.

### The Banquet

The annual banquet, held in the English Room, Fort Pitt Hotel, on the evening of Oct. 11, was featured by the presentation to Emanuel J. Janitzky, metallurgical engineer, Illinois Steel Co., of the Henry Marion Howe memorial gold medal, annually awarded by the

society for the best paper presented on steel treating during the preceding year; the presentation to Mrs. Henry Marion Howe, who was present, of a duplicate of this medal in bronze and the distribution of cups and money prizes to six Pittsburgh high school students who contributed the best essays on steel in a contest conducted jointly by the Pittsburgh chapter and a Pittsburgh daily paper. Three of the six prizes in this contest were won by girl students.

Officers of the society elected for the coming year were called upon by the retiring president, Tillman D. Lynch, and each made a brief speech. George Neilson, president Braeburn Steel Co., was toastmaster and introduced Capt. Irving O'Hay, who spoke on "What the World Needs—More Humor," a combination of the humorous and serious, filled with many of the personal experiences of the speaker, who participated in nine wars (some were mere revolutions of brief duration) and is said to have been the figure around whom Richard Harding Davis wrote the book, "Soldiers of Fortune." Governor Pinchot of Pennsylvania also was a speaker, his talk centering on his efforts to put the State on a sound financial basis and to stamp out saloons.

### Next Year's Meeting

For the next convention invitations have been received from Boston, New York, Cleveland, Buffalo, Atlantic City and Chicago. The location will be decided at the next meeting of the board of directors, to be held at Washington Nov. 2.

## A NEW ONE-MAN DUMP BUCKET

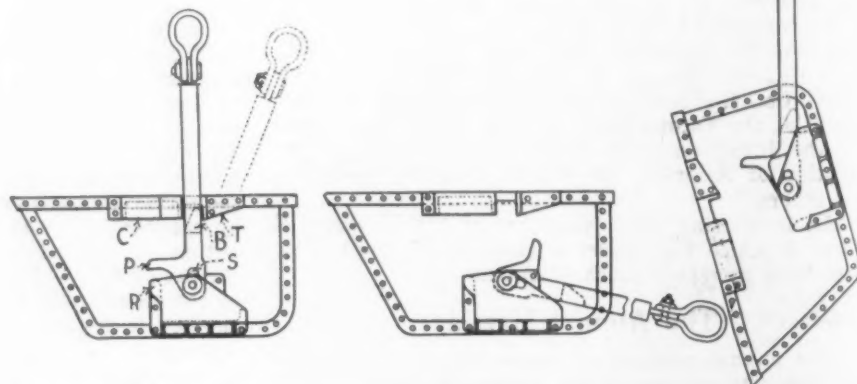
### Specially Designed Bail Permits Crane Operator to Handle It Alone

It is claimed for the Forsythe dump bucket, which has been patented by J. W. Forsythe and is being marketed by John D. Hiles Co., Oliver Building, Pittsburgh,

the position shown on dotted lines, Fig. 2, with *B* past the projection *T*. The operator then moves the crane slightly and pulls upward, which permits the bucket to dump its load. The load merely spills out of the bucket, avoiding the impact usually caused by dropping the load, and injury to the equipment into which the material is being dumped.

A level place is not required for dumping, as the bucket will operate from practically any inclination

In the Center the Bucket Is Shown in Position for Being Loaded; at Left, the Bail Has Been Raised and Locked in Position for Hoisting by *B* slipping past *T*; at Right Is the Dumping Position



that it eliminates the necessity of a man following the bucket to the place where it is to be dumped, or a man stationed at the dumping location, as the crane operator can dump the bucket, from his position on the crane, without any assistance.

Fig. 1 shows the bucket with the bail down in the position for loading. Fig. 2 shows the bucket in position for being lifted. This is accomplished by moving the crane so that the bail will go up against the stop *C*. Then the bail may be raised, which causes the block *B* to go up into the slot between the stop *C* and the tipper cam *T*, which will prevent the bucket from tipping. The bucket can then be carried to any place for dumping. Note the slotted opening in the bail ends, marked *S*. The bail is attached to the bucket by a heavy trunnion.

Fig. 3 shows the bucket in position for dumping. The crane operator, to dump the bucket, merely lowers it to the place of dumping, then slackens the cable to allow bail to lower in slot. The bail is then tilted into

or position. The bucket has been in service for two years in steel mills, handling roll scale, spiegel, hot cinder, hot crop ends from shears and saws, concrete, sand, gravel, dirt, coal, brick, etc.

### Bids on Plates for Big Four

An erroneous impression has been caused by a statement made in THE IRON AGE of Oct. 11 that on plates for the Big Four Railroad a Cleveland mill quoted 2.385c., Pittsburgh. The lowest bidder, a Cleveland company, made a quotation of 2.53c., Cleveland. This price was arrived at by taking the 2.50c., Pittsburgh basis, adding 31c., the freight from Pittsburgh to Indianapolis, making 2.81c., and deducting 28c. for the freight rate from Cleveland to Indianapolis. The plates are to be delivered by the Cleveland company to the Big Four Railroad at Cleveland, which will ship them to Indianapolis.



## LUXEMBURG MARKET WEAK

### Coke Shortage Serious—Buyers Await Lower Prices—French Competition for Export Severe

LUXEMBURG, Oct. 3.—Following a slight improvement in August, the situation in Luxemburg became almost critical in September. Arrivals of coke are smaller and smaller and all works are reducing their production; meanwhile, the blowing out of some furnaces appears inevitable.

The iron and steel market has declined as a result of the revival of activity in some of the Belgian works, which have quoted low prices to secure tonnage, and also because of the effort of French plants to export part of their products, in order to gain benefit of the coke bounty allowed on export tonnages, amounting to more than 100 fr. per ton on rolled steels. The Société De Coke De Hauts-Fourneaux can no longer continue such reductions and for October the bounty has been reduced to 30 fr. per ton of coke. Meanwhile, the situation in Luxemburg has been rendered acute.

The improvement of exchange has also affected the market, and buyers, impressed by this and by the con-

templated settlement of the Ruhr situation, are showing some hesitation in placing orders, hoping for an important decrease in prices shortly.

The considerable transactions, generally speculative, with Japan, have been counteracted by the measures taken by the Japanese Government to control the importation of materials for reconstruction. These measures were so precise and rational that they immediately stopped all speculation and the stoppage of the necessary credits has resulted in an immediate canceling of the contracts already placed.

The following prices are quoted for export, f.o.b. Antwerp, Belgian currency:

	Fr. Per Metric Ton
Castings No. 3.....	460 to 465
Ordinary Bessemer.....	445 to 450
<i>Semi-finished products:</i>	
Blooms, Bessemer.....	600 to 610
Billets.....	610 to 625
Largets.....	630 to 640
<i>Rolled steels:</i>	
Joists.....	700 to 710
Bars.....	740 to 750

The number of blast furnaces in activity on Sept. 29 was 27, with the furnaces at Esch and Rumelange all down. The output was 135,054 metric tons of pig iron and 109,737 metric tons of steel.

## FRENCH MARKET UNSTEADY

### Fluctuates with Political Developments—Coke Shortage a Factor—Export Rises and Falls with Exchange

PARIS, FRANCE, Oct. 5.—Every day sees a change in the situation of the market, according to the developments in international politics. When the end of passive resistance was announced, there was optimism not only in the financial but in the business world and immediately the franc rose in exchange, but it has again declined since the political situation in Germany is again cloudy and a prompt settlement of reparations no longer seems possible. As a result market conditions are totally changed.

When the pound sterling dropped to 72 fr., British dealers had an opportunity of selling in France and at the same time French exporters were less favorably situated for export, so that in the end the market has been quite unsettled.

Now that the pound sterling has again increased to 78 fr., British sellers can no longer enter French markets and export is once more improved. Business is naturally much affected by such fluctuations and it seems that the crisis is far from ended. Prices will remain firm until the pound drops again.

**Coke.**—The perequation price for coke has finally been established, and the increase does not appear to have had any great effect on prices generally. From Sept. 26 to 30, 29,853 tons of coke was received from the Ruhr, or 135,000 tons for the month of September, 30,000 tons more than August, a daily average of 4500 tons. At a meeting Oct. 2, it was decided to advance the price of coke to 212 fr. per metric ton, against 200 fr. for September. At this price, it is expected that it will be possible to deliver 50 per cent of the consumption capacity of the plants. Extra supplies would cost 250 fr. per metric ton.

**Pig Iron.**—The production of pig iron will not, apparently, be increased for some time because of coke scarcity, and consequently transactions are limited. Prices are fairly well sustained and vary according to the activity of the plants. No. 3 P. L. has been quoted at 430 to 450 fr. per metric ton. In hematite, transactions are much easier, even among sellers with large tonnages on hand. The current quotation is 475 to 500 fr., free, according to region. Cleveland No. 3 GMB is offered here at 480 fr., which is still considered high, and East Coast is higher at 500 to 510 fr., Paris. Lorraine sellers are quoting f.o.b. Antwerp, No. 3 P. L. 450 to 460 fr. (Belgian currency), and basic Bessemer ordinary casting, 445 to 450 fr. per metric ton.

**Ferroalloys.**—Production has been increasing but only during the first half, so that both domestic and export requirements have been difficult to meet with stocks on hand. This situation is now slightly improved, as prices have been influenced by the fall of exchange. French ferromanganese, 76 to 80 per cent Mn., quoted at 1600 fr. per metric ton but a few weeks ago is now worth 1550 fr. and British grades are quoted at 20 to 30 fr. lower. Spiegeleisen remains unchanged at 750 fr. for 18 to 20 per cent Mn. grade and at 625 fr. for 10 to 12 per cent Mn., both delivered.

**Semi-Finished Material.**—Available tonnages are still scarce. None of the Ruhr seized products has been so far sold on the French markets. Few transactions are noted, as works are well booked ahead. Open-hearth steel blooms have been sold at 640 fr. per metric ton, f.o.b. works, Meurthe and Moselle.

**Rolled Products.**—A declining tendency is evident. Export business is smaller and British products are now competing. Another factor is the arrival on the domestic market of the Ruhr seized products. For instance, the department of the Nord was supplied on Sept. 5 to 19 with 3345 tons of iron and steel, which is now being sold at a price practically equal to that of the world market. The average quotations for rolled steels is about 67 to 70 fr. per 100 kg.; however, a few transactions have been made in soft steel bars on a 72.50 fr. basis and open-hearth semi-hard has gone for 81 fr., base, with the price of coke at 200 fr. Lorraine mills quote, f.o.b. Antwerp, in Belgian currency: 750 fr. and have shaded prices from 10 to 20 fr. per metric ton for close business.

**Beams.**—Offers have been made by a large maker in the East on an order of 200 tons, as follows: Delivery 2 to 3 months, base price 660 fr. per metric ton, f.o.b. works. This contract, based on the current price of coke is revisable, at the rate of 2 fr. variation on 1 ton steel, per 1 fr. variation on 1 ton of coke. The contract is void should coke be quoted under 200 fr. or above 250 fr., or should the works receive less than a 50 per cent share of its average supply of coke. The current quotation of last week for beams was about 62 to 64 fr. per 100 kg., at works. Lorraine mills are asking, f.o.b. Antwerp, 725 fr. (Belgian currency).

**Sheets.**—Orders in heavy and medium sheets are still favorable and have improved in the lighter grades. Base prices continue unchanged and are as follows, f.o.b. cars Lorraine works:

	Fr. Per 100 Kg.
Large plates.....	65 to 67
Heavy sheets.....	67 to 70
Medium sheets.....	87 to 90
Light sheets.....	95 to 105

Plane galvanized sheets range from 195 to 120 fr. per 100 kg., according to sizes.

# Testing the Quality of Lubricating Oils

## Usual Tests Do Not Always Indicate Either Suitability or Durability—Other Tests Less Well Known May Be Better

BY WINSLOW H. HERSCHEL\*

THERE are two ways of buying oil, by brand and by specification. The former method must be used by those whose expenditure for lubricants is not large enough to warrant maintaining an oil testing laboratory. When oils are bought by brand it is in effect buying lubrication; that is, the price of oil includes engineering advice. It is known, however, that brands do not run uniform, and large consumers of oil usually prefer to employ their own chemists and lubrication engineers and to buy by specification. Government tests and specifications have been published.

Not many years ago laboratory methods of test were used mainly for identification, to determine whether two samples of oil were alike or different, or whether an oil fulfilled the requirements of specifications. These specifications were written with the idea of procuring an oil that should be a Chinese copy of an oil which had proved satisfactory in service. For this purpose it was not necessary that tests should indicate the quality of an oil, and many tests which have come to be generally accepted do not indicate quality except perhaps indirectly. It is, of course,

pressures, and that of incomplete film lubrication due to low speeds, high pressures or inadequate supply of lubricant. In either case the necessary properties of the lubricant may be divided into two classes—those which assure that the lubricant will be suitable for the purpose at hand, when new, and those properties which indicate durability; that is, the maintenance of the original properties for a sufficiently long period of time in storage or in use.

The first essential of a lubricant is that it shall be fluid enough to reach the rubbing surfaces and viscous enough to remain in place and prevent metallic contact. The lower the coefficient of friction the better, provided it is not obtained at too great a sacrifice of factor of safety or durability. The most commonly made tests are gravity, color, flash, fire, pour point and viscosity. Some of these indicate neither suitability nor durability.

### Gravity Tests

As there is no relation between gravity and viscosity, gravity has been discarded as a basis for fuel-oil specifications and fuel oil is now purchased by the Government on viscosity. Similarly, there is no relation between gravity and volatility, and specifications for gasoline are based on a fractional distillation.

At present, when the market is full of mixed oils and oils from the mid-continent field, it is often impossible to describe an oil as either distinctly of paraffin or of naphthalene base. It is believed that satisfactory lubricants may be made from any crude and, in Government specifications, by the omission of gravity and by other means, care has been taken not to eliminate any satisfactory oil on account of its source. Gravity has a legitimate use in determining absolute viscosity, as it enters into the relation between absolute viscosity and the time of flow as measured in the most commonly used types of viscosimeters.

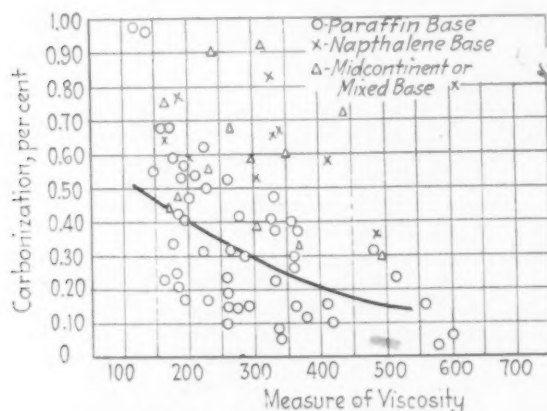
### Color Tests

The unwarranted emphasis put upon color may be due partly to the fact that the fatty oils, in use as lubricants before petroleum oils were put upon the market, were of light color, and color is a property easily observed. Refiners claim that they have to make oils of good color, whether they believe them of better quality or not, because the public demands it. Doubtless also refiners have educated the public to believe that a clear, light-colored oil is always of good quality. This is, however, not confirmed by test, and a water-white oil tested by the Bureau of Standards was found both by laboratory and engine tests to be wholly unfit for use, as it gummed badly.

### Fire and Flash Points

The flash point is to some extent a measure of the volatility of the most volatile constituent and hence an indication of fire hazard and loss from evaporation. The flash point of a blend, however, is higher than that of the lighter oil. The weakness of the test is that it gives no indication of the amount of this volatile matter, which information can be obtained only by an evaporation test or fractional distillation. Unfortunately these tests have not been standardized or generally adopted. The fire point serves as a check on the flash point, too great a difference between the two tests sometimes indicating that the flash point is incorrect because of failure to dry out the sample bottle after washing with gasoline.

Naphthalene-base oils are as a rule lower in fire and



Relation of Carbonization to Viscosity

admitted that service tests are the court of last appeal, and laboratory tests can serve only to reduce the number of expensive and time consuming service tests required, but it must be remembered that service tests as well as laboratory tests are subject to misinterpretation.

### Properties of a Lubricant

Lubricants may be solid or fluid, but are mainly liquids. A solid lubricant, like graphite, appears to act by forming a smoother rubbing surface than that of the metal. A most striking example of this is furnished by the use of "aquadag" in drawing the tungsten filaments for electric lights. The dies were once made as smooth as possible; now they are made purposely rough, better to retain the graphite surface with which the tungsten actually comes in contact. It is now coming to be believed that a liquid lubricant, owing to its property of so-called "oiliness," has a similar effect in coating the rubbing surfaces with an adsorbed film of colloidal dimensions.

For the most general condition of lubrication with a liquid, there are two régimes to be considered, that of complete film lubrication, at high speeds or low

\*U. S. Bureau of Standards. The paper, of which this is an abstract, was published by permission of the director of the bureau. It was read before the Engineers' Society of Western Pennsylvania.



flash points than corresponding paraffin-base oils of the same viscosity. In the Government specifications the fire point has been omitted and the flash point has been kept low enough not to cause the rejection of oils from any crude.

#### Pour Point

The effect of cold upon an oil may be expressed as a melting point or as a temperature of solidification, the present tendency being to discard the former and adopt the latter under the name of pour point. When machinery is to be used out of doors in winter, the pour point becomes of great importance. At lower temperatures the oil will not flow and hence cannot reach the rubbing surfaces. The pour test may be regarded, therefore, as an important suitability test.

There is no sudden change in consistency of oils at the pour point, as there is with water when it freezes; so that in cranking an automobile, for example, the question may arise whether a very viscous oil at a temperature above its pour point offers more or less resistance than another oil, which, at the same temperature, is below its pour point. The evidence appears to be that the viscous oil may offer the greater resistance because it winds about the shafts and sticks to them, while the oil which has solidified acts more like a grease, and "channels"; that is, a shaft or gear cuts a channel which does not fill up. As the machine continues to operate, the oil will heat until it ceases to channel, so that the temporary increase in friction due to lack of adequate lubrication will not be serious.

A very low pour point can be obtained only by the complete removal of paraffin, if originally present in the oil, so that the requirement of a low pour point may be more burdensome to some refiners than to others; yet when a pour point of minus 40 deg. Fahr. is necessary, as for airplane machine guns, it must be had, regardless of expense. On the other hand, to specify a lower pour point than required may needlessly restrict competition and increase the price of oil.

#### Viscosity Tests

A most important test for suitability is that for viscosity, although it is not a quality test at all unless viscosity is determined at two temperatures. All oils decrease in viscosity with an increase in temperature, but some decrease more than others, and an excessive change in viscosity is undesirable. The addition of fatty oils in compounding decreases the change of viscosity with the temperature.

The standard temperatures are 100, 130 and 210 deg. Fahr. Considering viscosity as a suitability test, the viscosity at only one of these temperatures is not a measure of quality. Porpoise jaw oil may be excellent for watches but it would be entirely unsuitable as an airplane motor oil and, conversely, castor oil is a good oil for heavy work but unsuitable for sewing machines. For any given machine there is a viscosity of minimum friction, and the ratio of the viscosity of the oil film at the operating temperature to the viscosity of minimum friction may be regarded as the factor of safety. Wilson suggests that a suitable factor of safety is 5, and shows that the actual factor of safety attained in practice is inconsistent.

Viscosity is more completely under control of the refiner than any other property. Any desired viscosity can be obtained by blending, as in mixing a spindle oil with cylinder stock, which has, however, the disadvantage that the cylinder stock is not so readily filtered as an oil of moderate viscosity. Cylinder stock (so called because it is the basis of steam-engine cylinder oil) is not usually made from naphthene-base crudes, which, however, furnish unblended oils of higher viscosity than do the paraffin-base crudes.

The measurement of viscosity with accuracy presents numerous difficulties. It is known that, after prolonged use, viscosimeters tend to show too high a time of flow. One explanation offered is that this is due to adsorbed films which accumulate in spite of the usual frequent cleaning of the outlet tube with gasoline. If this is the case, some better solvent such as benzol should be used.

Viscosity is the last on the list of tests in common

use. It will be seen, after running through the list, that none of these tests is found to throw much light upon the quality of the oil. Even the test for viscosity is deprived of its potential value by the custom of taking observations at only one temperature.

#### Miscellaneous Tests

Other tests which give promise of indicating quality have been less frequently used and are consequently less thoroughly standardized. They are forced to win their way if possible against considerable opposition and it often becomes a question whether the burden of proof is on the consumer to prove that a test is of value, or upon the producer to prove that oils which would be rejected by the test are better than those accepted, or at least as good.

#### Oiliness

Another most important property which influences suitability is oiliness, which causes a difference in friction between two lubricants of the same viscosity at the temperature of the oil film, when used on the same bearing under the same conditions of speed and pressure. Oiliness has no effect when there is complete film lubrication, so that at first sight it would appear to be unimportant except with gearing and heavy work, but there is incomplete film lubrication with all machinery on starting, unless some special device is provided, and there is always a possibility of incomplete film lubrication during operation if anything goes wrong.

Oiliness appears to be due to adhesion, adsorption or a segregation of some constituent of the lubricant at the boundaries, but it is imperfectly understood and cannot be definitely defined. Numerous methods have been proposed for measuring it, but it is still too early to predict what will eventually be the method adopted for routine tests.

There is no longer any doubt, however, that the property of oiliness exists and may be measured under suitable conditions of low speed or high pressure. Low speeds appear to be preferable as less liable to roughen the rubbing surfaces, and Deeley has shown noteworthy differences in oiliness between mineral and fatty oils. The superiority of fatty oils in this respect has long been conceded, and what is of more interest is whether there is any material difference in oiliness of mineral oils from different crudes. Various investigators are at work and it is to be expected that data will soon be available to help settle this question.

#### Emulsion Tests and Organic Acidity

There is considerable difference of opinion in regard to the best test to give assurance that an oil will be serviceable for long periods of use in circulating systems as in turbines and automobiles. The chief requirement for a turbine oil is that it must not emulsify in use, or, as it used to be expressed, the oil must separate readily from water. Now this specification is of no value because vague and indefinite, and it may be stated as a fundamental principle that a requirement of a specification cannot be enforced unless expressed as a numerical value which may be obtained by a reproducible method of test.

There are two general classes of emulsion tests. In the first, the oil is agitated by steam and the apparatus required is comparatively simple. It also has the advantage (or disadvantage) that the oil is kept at a high temperature, which facilitates the separation of oil from the water. In the other class of tests, mechanical agitation is employed, which permits the use of any temperature and any emulsifying liquid desired.

There is some justification for the use of an alkali solution in a suitability test, since alkali waters occur in arid regions and steam may be contaminated from boiler compounds. But more important is the question whether an emulsion test with caustic-soda solution is of value as a durability test.

It is said, as an objection to an emulsion test for automobile oils, that the oil will in any case emulsify after use for a short time, that it does not come into contact with water, and that even if it does it is better

to have an emulsion formed than for the water to freeze and stop the oil pump. But this is losing sight of the fact that an emulsion test for automobile oils is not a suitability but a durability test.

#### Carbon Residue Test

What the automobilist demands of an oil is "mileage" and freedom from carbon deposits. Mileage is, to a large extent, determined by the amount of dilution of the crank-case oil by the heavy ends of the gasoline, and is thus a fuel rather than a lubrication problem. Carbon also depends to some extent upon the tightness of piston rings and quality of fuel, since a lubricant reduced in viscosity by dilution with the fuel will more readily find its way into the cylinder. But to the extent that carbon is determined by quality rather than quantity of the lubricant that reaches the cylinder, a suitable test of the lubricant should indicate the amount of carbon deposits to be expected.

#### Waters Carbonization Test

The precipitation test gives the amount of asphaltic matter insoluble in petroleum ether and is used for steam-engine cylinder oils and car oils. Steam-turbine and automobile oils would all show a zero precipitation, but when they are heated they turn dark from the asphaltic matter developed by oxidation, and in the Waters carbonization test the amount of this asphaltic matter is determined.

## JAPAN'S BUYING STILL LIGHT

### Fairly Active Business With Warehouses—Chilean State Railways Issue Rail Tender

NEW YORK, Oct. 16.—Although rumors continue current of fairly large inquiries for all kinds of material from Japan, the large Japanese export houses are awaiting specific tenders from the proper department of the government, covering requirements for temporary construction in the devastated areas. In the meantime, a fair business is reported in small lots of sheets, both black and galvanized, wire nails and similar material from warehouses in Osaka and Kobe, which are replacing stocks that have already been drawn upon for immediate needs. One export interest reports an order from Japan for 1000 tons of wire rods and 400 tons of light rails and some purchasing of wire rods is rumored to have been done recently with Canadian mills.

A report, of which Japanese sources in New York as yet have not received confirmation, states that the Imperial Government will shortly issue a large list of machine tools for the arsenal.

Chinese purchasing is light, but a few transactions in wire rods are noted and it is currently reported but not confirmed that several thousand tons of second-hand material have recently been sold to Chinese merchants.

Bids on the annual rail requirements of the Chilean State Railways will be opened Nov. 27, at the main office in Chile. Specifications are available at the New York office of the railroad, 141 Broadway, New York, but bids are to be submitted direct to the railroad in Santiago, Chile. The specifications call for 16,500 tons of 100-lb. rails, including accessories, according to the requirements of the Chilean State Railways, which differ slightly from both the A. R. A. and A. S. C. E. specifications. Because of the uncertain European conditions this year it is believed that there is an excellent opportunity for American mills to obtain the business which two years ago was awarded to Germany.

As a sidelight on this tender it is noteworthy that, according to recent reports, a bill has been approved by the Chilean National Council of State, shortly to be submitted to Congress, calling for the expenditure of considerable sums annually on new railroad construction in Chile. The bill proposes to finance the new

The oils are heated under standard conditions for a given length of time at a standard temperature, in 150-cc. Erlenmeyer flasks, selected to have a maximum inside diameter of 65 mm. (2-9/16 in.). In the case of used oils the carbonization is the difference in asphaltic matter before and after heating.

Not all oils will pass this test, which is as would be expected, since it determines chemical instability, which is difficult for refiners to control. Since, however, the greater part of the oxidation is due to the lighter fractions, the carbonization value would be reduced by eliminating the more volatile constituents of the oil—that is, by making narrower cuts—in order to raise the boiling point of the lightest constituent for a given viscosity of the oil as a whole. The narrowness of cut may be determined by a fractional distillation, but a high vacuum is necessary to avoid cracking, and on this account the test is therefore much less likely to come into general use than the fractional distillation test for gasoline.

It seems preferable to use the Waters test, which detects a lack of resistance to oxidation, whatever may be the cause. There is considerable evidence that freedom from sulphur compounds is possibly an even more potent cause of low carbonization than narrowness of cuts. From the point of view of conservation, it is preferable that this should be the case, since the making of narrow cuts would make it difficult to utilize all fractions of the crude oil.

lines with surplus earnings of the existing State railroads, which are increasing as the result of lessening interest requirements as old loans are liquidated.

### British Pig Iron and Steel in September

LONDON, ENGLAND, Oct. 13 (By Cable).—The pig iron production in September showed a decrease of 41,200 tons from that of August, while the steel ingots and castings output registered an increase of 112,400 tons. The pig iron made last month was 558,600 tons with the steel ingot and castings total 695,100 tons.

Comparative data for the British steel industry in gross tons per month are as follows:

	Pig Iron	Steel Ingots and Castings
1913, per month.....	855,000	639,000
1920, per month.....	669,500	755,600
1921, per month.....	217,600	302,100
1922, per month.....	408,300	486,000
January, 1923 .....	567,900	634,300
February .....	544,400	707,100
March .....	633,600	802,500
April .....	652,200	749,400
May .....	714,200	821,000
June .....	692,900	767,700
July .....	655,100	624,300
August .....	599,800	582,700
September .....	558,600	695,100

The ventilating equipment for the new electrified No. 2 mill at the Lackawanna plant of the Bethlehem Steel Corporation will consist of two double width turbo conoidal blowers manufactured by the Buffalo Forge Co. Each is rated to deliver 60,000 cu. ft. of air per minute. Two Carrier air washers will be installed to clean and cool the air delivered by the blowers.

The Hartford Chapter, American Society for Steel Treating, announces a section meeting in Hartford in May, comprising chapters from New York, Boston, Providence, Springfield, Worcester, New Haven and Hartford, the first time the section meeting will have been held east of Bethlehem, Pa.

Sale of the Townsend combination armature coil winder and puller has been taken up by George Bender, 128 Centre Street, New York. The machine is an adjustable slot device and has attachments so that the winder after winding the coil pulls it into shape on the same machine.



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## Where Will It End?

A GREAT problem of the present time is how to educate the citizenry of this country respecting the fundamentals of economics. Failing to make any headway in that direction, we shall be subject constantly to the handicap of arbitrary restrictions and unwise regulations, together with now and then some positive crime of major order, as, for example, would be the granting of a bonus to the ex-soldiers. It would be excellent if members of Congress, labor leaders, and the members of governmental commissions, and even some bank presidents, could be compelled to pursue the curriculum of a good school in which economic theory and fact are taught.

The chairman of the Ways and Means Committee of the House of Representatives recently made these remarks:

An accumulation of \$1,000,000 in the hands of one man is no more useful for carrying on business than an average accumulation of \$100 by 10,000 men if the accumulations be joined, as they usually are, through bank deposits or other means, or otherwise used so as to render a useful return. There is much loose talk about the manner in which business is affected by national taxation. In these days when nearly every factory is running full blast, when railroads are moving more freight than ever in our history, when sales of commodities are at a high peak, it is merely cheap claptrap to assert business is being ruined by high taxes.

Now, there is a glimmering of truth in this gentleman's words, but only a glimmering. A million dollars in the hands of 10,000 men, if combined, would indeed have the same usefulness as if it were owned by one man. So far the thought is sound in theory. The weakness is in fact. It has been adequately demonstrated that the process of diffusing a million dollars does not transfer \$100 apiece to 10,000 men, but, rather, \$100 apiece to 5000, the remainder being wasted in the process. Something of that kind is being shown in our diminished rate of national saving.

This idea may be obscure to some minds, but there should be no obscurity to any in the vagary respecting the effect of taxation. The elemental economic working of taxation is the diversion of labor from direct production to the purposes of government. At the present time something like 10 per cent of the workers of this country are thus occupied. Yet the chairman of the Ways and Means Committee imagines that percentage to be

doubled and taxes raised correspondingly in order to pay the salaries. Activity in business would continue, for government employees must be fed and clothed and kept warm like other people, but very soon the diminished production of 80 per cent of the workers as compared with the previous 90 per cent would tell its story in higher prices and curtailed consumption. This effect of high taxation ought to be obvious. Not unlike this fallacy is that of the executive council of the American Federation of Labor, which "has no hesitancy in emphasizing the fact that the most potential factor against unemployment is resistance against wage reductions, which mean abridgment of power to purchase, to consume and to use the products of labor."

We shall not mind the carelessness that let the word "fact" be used instead of "belief," but shall merely point out that resistance to wage reductions is producing already a strangulation of industry and is the very thing that is going to cause unemployment. It ought to be obvious to this executive council that the raising of the price of anthracite in order not to abridge the purchasing power of 150,000 miners, *ipso facto* does abridge that of other workers. But they would probably agree with the idea of Governor Pinchot that such an advance ought to be absorbed by the operating companies so as to abridge the purchasing power of their stockholders. There seems to be an abridgment somewhere, however we figure it out.

Yet none of this sounds any more absurd than the opinion of the erudite though unlamented Coal Commission that operating companies earning more than some stipulated rate of profit ought to be penalized for their efficiency by taxation on their excess.

All of this pales into insignificance, though, in the face of the idea entertained by the great majority of Congressmen that we ought to provide the ex-soldiers with spending money owing to their loss of opportunity to profit out of the war.

But let us stop. It is all too much like the economics that might have been taught to Alice in Wonderland. We are surely going to have difficulty in steering our ship of state if such loose thinking continues to be prevalent in quarters that ought to know better. Out of the war people learned much that is useful and stimulating and also much that is unsound and dangerous. At times it seems that the latter predominates.



### A 1920-1923 Contrast

THREE years ago the disease of "cancelitis" was widely prevalent. Orders and contracts were canceled or repudiated in some cases; in other cases indefinite postponement was insisted upon. There arose a clamor against these actions. It was claimed that industrial activity was being killed, but that if men were forced to carry out their obligations the activity would continue and prosperity would be preserved.

After the lapse of only a few months it became clear to the majority of men that the trouble lay not in the cancellations, but in the unsoundness of the commercial transactions the carrying out of which was thus avoided. There had been commercial activity which industrial activity was unable to carry out.

In important respects the condition today is the reverse of that which obtained three years ago. The volume of commercial activity, in the making of contracts and purchases, is much smaller than the volume of industrial activity. In the long run the two must balance. Three years ago there was more of the former than the latter could carry out, and some had to be canceled. There was, therefore, an unsound condition. Now there is a gap on the other side, and it is by no means unreasonable to feel that this indicates decidedly a condition of soundness.

The gap can be bridged either by commercial activity increasing or industrial activity decreasing. It would be easy for commercial activity to increase, while unless there is unsoundness not laid bare thus far, industrial activity has no reason for decreasing materially. Contracts and sales orders do not provide buying power. Industrial activity does. It makes payrolls and profits. The income of the people of the United States is running very large at the present time. Unless the buying activity has been due chiefly to borrowing, it can continue. The appearance is that it has rested chiefly upon income. Credit has not been strained.

Throughout this present year there have been opportunities for comparing developments and circumstances with those of 1920, for both years have been big and active. Almost every comparison has shown a striking dissimilarity. Under apparently similar circumstances things have moved differently. That is because after 1920 men recognized that they had made mistakes, and this year they have been firm in their attitude to avoid those mistakes. All that we have seen thus far suggests that things will now move differently from their course at the end of 1920. Naturally it would be unsafe to predict that we shall not next year see any of the things we saw in 1921, but it is plain that if we do reach any of those things it will be by a different route, one which is not now to be seen. Three years ago there had been an excess of confidence. Now if there is any excess it is one of conservatism.

A simple illustration of the difference in conditions may be added. On July 1, 1921, the United States Steel Corporation had 5,117,868 tons of unfilled obligations, and in that month it operated at about 25 per cent of capacity. At the beginning of this month the corporation had a

slightly smaller tonnage, but its customers seem to desire that it operate at 85 or 90 per cent of capacity.

### Some Labor Tendencies

RECENT developments of importance in the relations of capital and labor indicate a different attitude on the part of some of the labor leaders. To what extent conditions will be permanently improved, no one can predict at the present time, but certain changes of policy are entitled to receive thoughtful consideration.

The admission by the secretary of the committee representing 14 international unions that the effort to organize the steel workers of the country has been coolly received, not only by wage workers but by international union officers, since the substitution of the eight-hour and the ten-hour day for the twelve-hour day is virtually a surrender on the part of those who had hoped greatly to extend membership in unions. The result will be received with considerable satisfaction by the advocates of the shorter day. It is a fact long recognized that where working conditions are satisfactory, many workers have little use for unions and the propaganda of militancy constantly carried on by their leaders, and the present aloofness of steel works employees furnishes new evidence of that fact. It should be noted that union officials have not yet given up hope and will attempt to "bore from within" by getting men who are not now engaged in steel plants to obtain employment there, but the movement is not likely to gain much headway as long as steel workers are satisfied with their wages and working conditions.

The progress made by labor unions in the past three years in establishing banks, as reviewed in our Washington letter in this issue and as reported to the Portland convention of the American Federation of Labor, shows a decided change of policy, which is described as an effort to substitute for the strike the labor unions' money power as a more effective weapon for the workers' defense. To what extent the strike will be discouraged by the banking institutions of the labor unions remains to be seen, but it is certain that as the labor unions get into banking they will understand more clearly the attitude of the business man. The banks of labor unions will exert a conservative influence, and employers generally will welcome them.

Another conservative tendency of late is shown by the opposition of some of the labor unions to the Red element. There has been room for a house cleaning and every step in that direction will improve the relations of all employers and employees who really want to get along together. It is particularly interesting to see the American Federation of Labor now putting Foster, the leader of the steel strike of 1919, where he belongs, and to recall the white-washing this man was given in the steel strike report written by radicals and foisted upon the Interchurch World Movement.

DAILY production of electricity by public utility plants in the United States is one measure of industrial activity, admitting that it also includes consumption for household and other uses. Expressed in millions of kilowatt-hours per day,

the average for the first eight months of 1923, as gathered from reports of the United States Geological Survey, was 151 against a daily average for all of 1922 of about 130.5. The 1922 figure resulted from a rapid rise in consumption of electricity in the latter half of the year, reaching nearly 149 in December. The noteworthy fact is that since then the daily average has not dropped below December, save in July when it was 147, and has not been greater than 154, reached in February. Instead, production has remained on a high level, not only nearly one-sixth better than in 1922, but over one-fourth higher than in 1920 and over 40 per cent above 1919. Outstanding is, of course, the evidence of the expansion of the central station, due undoubtedly to more industrial plants depending for light and power on the central station and to the greater use by the family of electricity for lighting and other household appliances. Statistics are not available at this writing as to the part taken in different years by water-power stations, but at the present time about 60 per cent of the electricity comes from fuel-burning plants and 40 per cent from hydraulic developments.

### The Steel Treaters' Movement

THE demand for an organization such as the American Society for Steel Treating was strongly demonstrated last week in Pittsburgh. At its fifth annual gathering this society successfully put through a technical program and a steel exhibition which would reflect credit on a much older body. In the quality of the papers presented, in the scope of the products exhibited, and in the attendance, the meeting was a surprise to some of the most ardent steel treaters.

A feature of the convention from a technical standpoint was the high standard set by the program as a whole. In a single session the names of some of the most prominent metallurgists of the country on the list of participants made it an occasion that recalled meetings only a few years ago of the steel section of the mining engineers. A second feature was the general youthfulness of the membership, testifying to enthusiasm in their work and to the impelling power behind the accomplishment of the future. Here, in a comparatively new field, or one in which scientific knowledge, methods and apparatus are transforming a crude art, are possibilities from which much will be heard in the near future.

The exhibition, commercially and in every other way, was a success and now ranks close to the older one which is a feature of the annual gathering of American foundrymen. There were some suggestions that there is danger of giving too much prominence to the commercial side. It is to be hoped that the commercial features will not be overstressed or to the point of detracting from the technical possibilities of so promising an organization. Besides the usual showing of heat-treating equipment of all kinds were the attractive exhibits of large and small steel companies and machine tool interests.

The new society is thus affording a meeting place, not only for the steel treater and metallurgist, but for all steel makers and users who would

have American steel products benefit to the fullest extent from the scientific advance that is now so prominently before the industry.

### Steel Producers as Consumers

AT intervals the question has been discussed whether it is well for a steel producing interest, meaning a producer of the ordinary rolled forms of steel, to work up any of that steel into manufactured products for the market, or in other words for the steel producer to be also a steel consumer. Thus far there has been no strongly marked trend in that direction, as has been the case with several important companies on the Continent of Europe. The great bulk of the rolled steel produced in the United States changes ownership before anything further occurs to the steel.

Since the steel producing capacity of the country is now very large and marketing is not altogether as easy as it was before the war, there may be more disposition on the part of mills to add to their organizations, by construction or purchase, manufacturing departments to furnish outlets for portions of their rolled steel output. It is characteristic of steel enterprises to grow, and if there is no occasion to grow in tonnage then occasion may be found to grow in other ways.

Another factor in this question is the well recognized trend in steel manufacture to adapt the rolled steel product to particular uses. There is more carbon steel, more alloy steel, more special finish steel, than formerly. In adapting the steel to various particular uses, the work of producing and the work of consuming are brought closer together, and it would not be unnatural that the ownership of the two classes of work should be combined.

Among steel manufacturers in general there has been from the beginning a feeling that the steel producer should not compete with his customers. To establish a department for working up steel is, theoretically, to set up competition with the customers who are producing similar finished articles. In theory, of course, that policy is eminently sound, but there is left room for the question why the steel mill should want to sell also to those consumers.

This brings up a still broader question, why the ambition of almost every steel producing interest has been to have such a wide market. It is notable that such is the case. Almost every steel producer desires to have a "full line" of the various products. Also, there is a desire to sell all over the country. If the producer is in the East it is considered natural to seek a combination with a producer in the West, so as to "save freight." The result of all this is to increase competition.

If the country were growing smaller or the number of steel mill products were decreasing, the ambition so long possessed by steel manufacturers might bear promise of fulfillment, but the reverse is the case. It would seem more natural for mills to select their geographical territory and to select the finished lines on which they will specialize and then, where feasible, to connect themselves with consuming departments to work up their respective mill products. This would involve a complete reversal of a policy that seems to have been fundamental with the typical steel producer from time immemorial.



## REFERS TO PITTSBURGH BASE

### Unusual Course of Interstate Commerce Commission in Deciding Rate Case

WASHINGTON, Oct. 15.—In a decision announced last Thursday the Interstate Commerce Commission held as not justified proposed increased rates on iron and steel products in carloads and less than carloads from the Pittsburgh-Buffalo territories and territories east to Virginia cities and points taking the same rates. The decision grew out of complaints filed by a large number of protestants including the Donner Steel Co., manufacturers of iron and steel in Ironton, Ohio, and Ashland, Ky., the Newport News Shipbuilding & Drydock Co. The proposed increases range from 2 to 4.5 per cent per 100 lb. Typical of increases proposed was an advance of from 38c. to 40.5c. per 100 lb. from Pittsburgh, Dubois and Punxsutawney, Pa., to Newport News, Norfolk, Portsmouth, and Richmond, Va.

In seeking these increases, the railroads attempted to justify their action by the fact that the rate from Pittsburgh to the Virginia cities should be made on the Columbus, Ohio, to Baltimore basis. It was contended by the railroads that the adjustment developed from demands made upon their operating routes from Pittsburgh to the Virginia cities by way of junctions in central territory by iron and steel producers in the Mahoning and Shenango Valleys and southern Ohio for rates from these Ohio points and through those junctions equal to those applicable from Pittsburgh over Eastern routes. The present 38c. rate from Pittsburgh to Newport News, Norfolk, Richmond and Portsmouth, applies only through certain Eastern gateways and from so-called 60 per cent territory only. It does not

apply through or from Western gateways, such as Columbus or Circleville, Ohio, or Kenova, or Huntington, W. Va. The railroads maintained that the contention of commodity rates from Pittsburgh and Buffalo to Virginia cities will force reductions from producing points west of the 60 per cent group from which the class rates to the Virginia cities are the same as from 60 per cent territory "thereby producing demoralization in the iron and steel rates and absorbing the entire rate fabric-iron and steel articles from central territory to trunk line on territory." The Donner Steel Co. objected to Buffalo being tied to Columbus and pointed out that from Buffalo to Norfolk by way of Columbus, the distance is 998 miles, while over the short line the distance is 582 miles.

The report of the commission in its conclusion took the rather unusual course of referring to the Pittsburgh base case and said that inasmuch as steel prices are fixed on the Pittsburgh base and the freight to destination is added, an increase in rates from Pittsburgh would mean an increase in the price of steel. This doctrine now is the subject of a long drawn out hearing before the Federal Trade Commission and it is considered rather remarkable that a body like the Interstate Commerce Commission should have made mention of the Pittsburgh base case in this decision.

Its comment on this subject follows:

"In the iron and steel industry the price of steel articles, outside of Pittsburgh wherever manufactured, is the Pittsburgh price plus the freight rate from Pittsburgh to destination. Because of this so-called Pittsburgh basing point for steel practice, an increase in the freight rate from Pittsburgh increases in like amount the price of steel, no matter where the purchase is made. This, however, respondents state, is no fault of theirs, and they do not benefit therefrom."

## TO FIGHT PITTSBURGH BASING

### Nineteen States Form New Organization, Which Will Hold Meeting in Chicago

The Associated States Opposing Pittsburgh Plus, a new organization embracing 19 States, will hold its first meeting at Chicago, Oct. 18. The formation of the association followed the appropriation of \$55,000 by Illinois, Iowa, Minnesota and Wisconsin to fight the Pittsburgh basing point practice. A joint commission formed by those four States invited the cooperation of other States with the result that the governors and attorneys general of 15 additional commonwealths have given the movement their support. The initial meeting of the 19 associated States will consider methods for stimulating the campaign against "Pittsburgh plus" and will arrange to provide additional funds therefor.

W. E. McCollum, secretary of the Western Association of Rolled Steel Consumers, the organization which started the campaign against "Pittsburgh plus," has been retained as assistant secretary of the new body with offices in the City Hall Square Building, Chicago. H. G. Pickering, counsel for the Western Association, has been retained to make a digest of the 18,000 pages of testimony and 1500 exhibits thus far taken and filed in the Pittsburgh basing point hearings before the Federal Trade Commission. The new body is described as "an association to relieve the ultimate consumer of rolled steel and rolled steel products from the artificial and unjust practice of steel producers known as 'Pittsburgh Plus.'" It is understood that it is planned to file a brief on behalf of the associated states with the Federal Trade Commission, to be signed by the governor and attorney general of each State participating. Chapters in the brief will show how the practice affects industry in each State and the extent to which it imposes a tax on the ultimate consumer.

The joint commission representing Illinois, Wisconsin, Iowa and Minnesota has already been active in the case before the federal commission. The taking of rebuttal testimony, first scheduled for Aug. 6, was postponed at the instance of the joint commission until Dec. 10. This was to permit further inquiry to be

made into the economic phases of the case, to rebut claims of the respondent, the United States Steel Corporation, which bases its defense on the grounds that the Pittsburgh basing point practice is the result of the operation of the economic law of supply and demand. According to its theory, Pittsburgh, as the point of surplus production of rolled steel, naturally dominates the market and sets the price.

To combat this argument, the joint commission of the four States retained the services of Dr. John R. Commons, professor of economics at the University of Wisconsin. He will be assisted by Dr. Frank A. Fetter, professor of economics at Princeton University, and Dr. W. Z. Ripley, professor of economics at Harvard University, and all three will testify in the pending case.

The member States belonging to the Associated States Opposing Pittsburgh Plus are listed below. Other States have been invited to join and it is possible that before the rebuttal in the federal commission case begins more will be enrolled as members.

### Members of Associated States Opposing Pittsburgh Plus

#### State Commissions

Illinois—Hon. B. F. Baker, Kewanee, chairman; Senator John T. Denvir, Chicago, vice-chairman; Hon. Robert Scholes, Peoria, secretary; Senator Randolph Boyd, Galva; Hon. J. E. McMackin, Salem; Hon. Burton F. Peek, Moline; Hon. S. H. Thompson, Quincy.

Iowa—Governor N. E. Kendall, Attorney-General Ben. J. Gibson.

Minnesota—Governor J. A. O. Preus, Attorney-General Clifford L. Hilton.

Wisconsin—Governor J. J. Blaine, Attorney-General Herman L. Ekern.

#### Directors-at-Large

Florida—Governor Cary A. Hardee, Attorney-General Rivers Buford.

Georgia—Governor Clifford Walker, Attorney-General George M. Napier.

Idaho—Attorney-General A. H. Conner.

South Dakota—Governor W. H. McMaster, Attorney-General Buell F. Jones.

Indiana—Governor W. T. McCray, Attorney-General U. S. Leash.

Kansas—Governor Jonathan M. Davis.

Kentucky—Governor Edwin P. Morrow, Attorney-General Thomas B. McGregor.  
 Michigan—Governor Alex J. Groesbeck, Attorney-General Andrew B. Dougherty.  
 Missouri—Governor A. M. Hyde, Attorney-General Jesse W. Barrett.  
 Montana—Governor Joseph M. Dixon.  
 North Dakota—Governor R. A. Nestos, Attorney-General George F. Shafer.

Nebraska—Attorney-General O. G. Spellman.  
 Nevada—Governor M. A. Diskin.  
 New Mexico—Hon. Jose A. Baca, acting governor; Assistant Attorney-General, J. W. Armstrong.  
 Oklahoma—Attorney-General George F. Short.

The subject of "Pittsburgh plus" will also be discussed at a conference of the governors of all the States which will be held at West Baden, Ind., Oct. 18 and 19.

## SALVAGING WASTE MATERIAL

### Detroit Company Adds to Profits by Reclaiming Steel from Scrap Piles

Reclamation of steel from the scrap pile, such steel to be remanufactured into toys and other articles instead of being sold for re-melting purposes, has proved such a profitable enterprise for the Velick Scrap Iron & Machinery Co., Detroit, that it has organized a subsidiary company, the Steel Materials Co., which will make a business of salvaging material that can be used for manufacturing purposes.

Sheet metal scrap has proved to be a profitable source of reclaimable material. Ordinarily most of the sheet metal scrap produced in the manufacture of stampings is bundled and sold to steel plants to be re-melted in the open-hearth furnace. Some of the Detroit plants produce large quantities of sheet steel scrap and much of this, particularly that coming from automobile body plants and stove plants, contains pieces large enough for use in making other products.

#### Good Profit in Salvaged Sheets

After a section for an automobile body, for example, is cut from a sheet, pieces several inches long and wide can be salvaged from the resulting scrap. This scrap on reaching the scrap yard of the Velick company is looked over and pieces that are large enough are cut off on a small shear and sorted according to gages and class of material. It is stated that as much as 75 per cent of some of the sheet steel scrap can be salvaged and that a laborer can shear two tons of reclaimable pieces of this material at a cost of \$2.50 a ton. The cost of salvaging this scrap and delivering it to a customer is placed at \$7 to \$8 a ton and it is stated that the material brings from \$20 to \$30 a ton delivered. Sheet stampings that are left after the salvaging are bundled in the usual way.

The salvaged material is sold to small stamping plants and is used mostly for the manufacture of toys. As the scrap is in varying sizes, samples are submitted to the prospective customer to show him the range of sizes so that he can determine whether he can use the material in making his product. One toy manufacturer purchases the salvaged pieces of sheet steel in carloads.

The Steel Materials Co. will install stamping presses and manufacture from sheet scrap blanks for various parts according to a customer's specifications and these blanks will be shipped to the buyer's plant for the forming operations. The company will also make various products from the stamping scrap. Among the sheet scrap that it is receiving are discs about 8 in. in diameter that are produced as scrap in stamping disc clutches for automobiles. These discs are being formed into plates for building stanchions.

#### Bolts and Nuts Also Reclaimed

Bolts, nuts and rivets in sizable lots reach the yard as scrap. These are rolled in tumbling barrels to take off the rust after which they are oiled and look about as good as new. Scrap pipe is being converted into nipples and couplings. Old boiler tubes 4 in. in diameter are being converted into building stanchions instead of being sold as busheling scrap. These are first straightened after they are bent, then they are put in long tumbling barrels to take off the rust after which they are cut to length and dip painted.

The Velick company conveys scrap from the various Detroit producers' plants in a fleet of 54 trailers of 5 ton capacity built by the Detroit Trailer Co. These trailers are left at the plant to be loaded and are hauled away by trucks that leave empty trailers, a truck haul-

ing two loaded trailers. The trailers have bodies 10 ft. long and 3 ft. high and the sides and ends may be pried out for convenience in unloading material. A special locking device is provided to prevent the sides and ends from bulging out at the top when the truck is loaded. This method of leaving trailers at plants to be loaded with scrap as produced has been adopted by several Detroit scrap dealers and has proved a convenience to scrap producing plants and altogether appears to be a very satisfactory transportation method when applied to plants that produce scrap in large quantities.

### Pipe Rate Not Unreasonable

WASHINGTON, Oct. 16.—In a tentative report announced last week, Examiner Henry C. Keene of the Interstate Commerce Commission held that rates on pipe from McKeesport, Pittsburgh, Woodlawn and Elwood City, Pa., Lorain and Youngstown, Ohio, and Wheeling, W. Va., to Taft, Cal., are not unreasonable or prejudicial. He consequently recommended dismissal of a complaint filed against these rates by the Standard Oil Co. of California. Combinations on Chicago and Bakersfield, Cal., of \$1.50 from McKeesport, Pittsburgh, Woodlawn, Elwood City and Wheeling, \$1.48 from Youngstown, and \$1.45 from Lorain are now applicable to Taft.

The complaint was directed against rates on pipe prevailing since Feb. 5, 1921, up to the present time. It was contended that the rates are unreasonable to the extent that they exceed transcontinental rates on pipe from corresponding points of origin to other California destinations, including Bakersfield.

### Temperatures Encountered in Charcoal Furnace Practice

Data collected from six charcoal iron furnaces have been studied by technologists of the Minneapolis experiment station of the Bureau of Mines, Department of the Interior, in the preparation of a report on the temperatures encountered in charcoal furnace practice. Temperature readings on the slag, metal and tuyeres have been tabulated for comparison with similar observations on fifty-one coke furnaces. A material balance for each furnace is under way. The small slag volume in charcoal practice leads to some interesting conclusions regarding the effect on slag temperature produced by changes in the proportion of total slag derived from ash in the fuel.

The decline in construction volume which began in June continued through September, according to F. W. Dodge Corporation. However, the September drop from August was only 3 per cent. This year's construction volume to date in the 36 Eastern States has amounted to \$3,012,610,500. Last month's record for the 36 States included the following important items: \$111,906,000, or 39 per cent, for residential buildings; \$55,010,800, or 19 per cent, for public works and utilities; \$44,141,700, or 15 per cent, for business buildings; \$38,059,300, or 13 per cent, for industrial buildings, and \$16,399,000, or 5 per cent, for educational buildings.

R. A. Bull, research director, Electric Steel Founders Research Group, was the speaker at the regular monthly meeting of the Pittsburgh Foundrymen's Association at the General Forbes Hotel, Monday evening, Oct. 15. His subject was "Cooperation as a Factor in Making Better Castings Cheaper."



## BELGIAN MARKET FIRM

Exchange a Factor—Buyers Await Lower Prices—  
Export Sales Fair—September Pig Iron  
Production Higher

ANTWERP, BELGIUM, Sept. 29.—Nominal domestic prices, f.o.b. cars, producer's works are as follows per metric ton, with the dollar at 18.50 fr.

	Fr.	
Commercial iron No. 2.....	700 or	\$38.00
Commercial iron No. 3.....	775 or	42.00
Commercial iron No. 4.....	800 or	43.25
Heavy sheets .....	800 or	43.25
Light sheets .....	1,150 or	62.00
Iron bars .....	750 or	40.50
Rails .....	750 or	40.50
Heavy beams .....	725 or	39.20
Rods .....	950 or	51.50
Open-hearth steel, ordinary.....	760 or	41.00
Rounds .....	1,400 or	75.60
Spring steel.....	1,350 or	73.00
Basic Bessemer ingots.....	560 or	30.20
Blooms .....	600 or	32.40
Billets .....	620 or	33.60
Targets .....	640 or	34.60

It has generally been expected that as the franc increased in value, iron and steel prices would decline and buyers have, therefore, refrained from purchasing except for immediate requirements. However, the large producers are fully booked up to the end of the year and consequently are not at all inclined to lower prices. Instead prices have been firm and generally have been maintained at the same level, except for slight concessions by a few works that had not yet sufficient tonnage ahead. British importers have made several firm offers, but at no increase in sterling prices. Such business was not accepted considering the low price this would mean with the present exchange rate of 85 fr. to the pound.

Commercial iron seems more affected than most other products, transactions in No. 2 iron being reported at as low as 675 fr. or \$36.40. There is keen competition for orders among the large works, as domestic business is not heavy and export orders are at present extremely scarce. The better grades of iron are firmer. Only a few works have accepted orders for No. 3 iron at low prices such as 700 fr. or \$38. The current quotation is 750 to 775 fr. or \$40.50 to \$42.

Business in steel products is light. In order to book as many orders as formerly, prices would have to be reduced almost proportionate to the decline in exchange. Makers, however, are firm and as most mills are at present well provided with orders, prices will probably hold at about the present level until the situation is again normal. Exporters have generally been able to place orders with works not yet fully booked at prices such as 725 fr., f.o.b. Antwerp for iron bars (\$39.20, about \$1.50 under the nominal domestic price) and 700 fr. f.o.b. Antwerp (\$38), for beams compared with a domestic quotation of 725 to 750 fr., (\$39.20 to \$40.50). Other steel products, which are in greater demand are firmer and prices are well maintained.

In August there were 39 blast furnaces in operation, producing about 200,000 tons of pig iron and about 210,000 tons of rough steel. This is an increase over previous months. The production of castings direct from furnaces was 5800 tons; finished steel 174,000 tons, and finished iron 17,500 tons.

Pig iron is quiet. Furnaces are disposing of a satisfactory tonnage to domestic customers, but although no large lots have been piled it has been necessary to reduce prices. The ruling price for No. 3 is 460 to 475 fr., \$24.80 to \$25.20 per metric ton delivered to consumer's works, or f.o.b. Antwerp. Lorraine foundry No. 3, high phosphorous is also plentiful at about the same prices. Only Luxemburg makers are maintaining higher quotations, as they are facing a coke shortage and unless arrivals from Germany increase several furnaces may be blown out. The same situation prevails in Luxemburg, iron and steel products, so that contrary to the usual situation Luxemburg mills for offering on the Belgian market small quantities at higher prices than French or Belgian works. At one time it was thought that pig iron makers would be

compelled to reduce prices drastically as the rate of exchange declined to 80 fr. to the pound sterling. The Middlesbrough makers had, in the meantime, reduced their prices so that this grade of iron, equal to the best Belgian brand, was offered at about 104s. c.i.f. Antwerp, nearly 416 fr. per ton, or about 434 fr., delivered, \$23.40. Later the rate of exchange improved so that this grade of pig iron is now costing about 440 fr. at Antwerp.

Good tonnages of British hematite have been placed in Belgium, notwithstanding reductions by Belgian and French makers as a result of declining exchange. The British, French and Belgian prices are nearly the same.

Basic Bessemer iron is quoted at 445 to 450 fr., \$24.20. No large quantities, however, are available and Belgian producers are even buying large quantities from Lorraine works to supply customers.

The coal market is satisfactory with demand heavy and prices going still higher principally because of higher wages. Coke prices are not much changed. The production in August was nearly 365,000 metric tons. Arrivals from Germany, although not sufficient, have been larger than were expected. About 112,000 tons of coal was imported from the Ruhr during the first 20 days of September, including about 22,000 tons of coke.

## Truscon Steel Co. Anniversary

Officials and employees of the Truscon Steel Co., fabricating interest of Youngstown, will observe on Oct. 23 the twentieth anniversary of the founding of the business. A "family" meeting will be held, when a message delivered by President Julius Kahn will be broadcasted to the company's agents throughout the country. The Truscon Employees' Relief Association will be formed at this time, for the benefit of plant workers who become sick or disabled.

Another feature of the anniversary will be the launching of a vigorous three-months' sales campaign, under the direction of C. I. Auten, manager of the steel building department; W. C. Conger, manager of the hy-rib and lath department and M. T. Clark, manager of the sash department.

President Kahn states the company was formed 20 years ago with an initial capital of \$200,000, and a "handful of employees." The original plant was located in Detroit.

## Hearing of Assigned Car Cases

WASHINGTON, Oct. 16.—Protests made by iron and steel and other interests owning private cars have resulted in the Interstate Commerce Commission entering an order reopening the assigned coal car cases. Oct. 22 has been fixed as the date for hearing evidence and further arguments, which will take place in Washington under the direction of Commissioner Aitchison. Meanwhile the effective date of the decision in this case has again been postponed, this time to Dec. 1.

Sizer Steel Corporation plants at Buffalo and Syracuse, N. Y., will be operated until Dec. 31 under authorization of Federal Judge John M. Hazel, Buffalo, who signed an order on Oct. 10 whereby receivers may issue certificates for \$50,000 to be used for this purpose. The corporation went into receivership July 3, when liabilities were reported at \$2,000,000, about 75 per cent of which was in secured mortgages. At that time President C. B. Porter and S. F. Hancock, a Syracuse lawyer, were named receivers.

Standard couplings for hose connections in fighting fire are now in use in about one-fourth of all the towns in the United States. The value of the standardization was demonstrated at a recent meeting of the National Fire Waste Council in Washington by Maj. J. H. Howland, engineer of the National Board of Fire Underwriters, assisted by the Bureau of Standards of the Department of Commerce.

# Iron and Steel Markets

## SHIPMENTS STILL HEAVY

### New Buying Falls Short — Railroad Demand Leads

#### Price Concessions on Various Products—Large New Structural Projects

The steel market shows substantially the same cross-currents that have been recognized for six weeks or more. Consumption is somewhat less, though still heavy; shipments from mills are well in excess of new orders; and there is yielding in finished steel prices, though rarely in plates, shapes or bars. On the favorable side is the prospect of good equipment orders from the railroads, sustained building demand and unusual November-December building of automobiles.

Last week the expected renewal of car buying was encouraging. Car builders now say that this is not likely to come before the first of the year, the price of car steel being an undetermined factor. This week several large locomotive inquiries have come up, including 80 for the Missouri Pacific and 39 for the Louisville & Nashville. These, with lots for the Southern Pacific, B. & O. and Pennsylvania, make a total close to 200.

Reports of large bar inquiries for the Ford Motor Co. and for other Detroit buyers have been given prominence but these are only in line with automobile plant schedules already announced.

Apart from the banking of two blast furnaces at Joliet, Ill., the Steel Corporation's operations are unchanged. Independent producers are under rather than over the 70 per cent mark.

An indication that the heavy shipments of leading mills in the past two months have given some buyers more steel than they need is the cropping up of resale business here and there at less than current mill prices. The bar market has furnished a number of examples.

In warehouse business in the Central West weakness has developed from the same cause, jobbers having gone \$2 a ton below recent prices on plates, shapes and bars.

A 5 per cent reduction in nuts and bolts, effective Oct. 13, has been made by one large Central Western maker.

At Chicago inquiries for tie plates, spikes and bolts are large. The distribution of the Missouri Pacific rail order gives 14,000 tons to Chicago, 10,000 tons to the Colorado mill and 8000 tons to Ensley, Ala.

The sheet market continues to show that various mills are making concessions because they need orders, but the September orders booked by independent mills reporting to the statistical association were 107,000 tons more than in August, last month's total being 223,000 tons. For the first month since March sales were in excess of shipments.

Large consumption continues in fabricated steel. While the week's bookings dropped to 10,000 tons, fresh projects calling for 75,000 tons

appeared, over two-thirds in the New York metropolitan district.

American chances are considered good for supplying the Chilean State Railways with 16,500 tons of 100-lb. rails and accessories on which bids will be taken Nov. 27. The purchases of two years ago were made in Germany. A 10,000-ton rail order for China has just been booked by Belgium.

Prices for semi-finished steel have a range of about \$2.50 a ton, as indicated by \$40 to \$42.50 for rerolling billets and \$45 to \$47.50 for forging billets, with smaller deviations from the \$42.50 contract price for sheet bars.

Cleveland reports a 5000-ton sheet bar inquiry from Japan and a Chicago mill has booked 3000 tons of black and galvanized sheets for Tokyo.

Domestic cast-iron pipe manufacturers lost the 4000-ton order at Los Angeles, Cal., to the French plant at Pont-a-Mousson. Shipment will be made through the Panama Canal. Business has been so good with all the pipe foundries that this single contract will not be missed, but it shows that Continental competition is to be reckoned with at any time.

Weakness of Southern pig iron is most pronounced at points distant from Birmingham, as shown by a quotation of \$19, Birmingham, or \$2 below the recent price made to a Western company which was able to obtain a still lower delivered price on Northern iron. Buffalo iron has receded to a basis of \$22 and eastern Pennsylvania to \$23, and the market is not firm at the new quotations. Owing to the almost entire absence of transactions at Pittsburgh, prices are untested. Numerous merchant furnace operators are considering the advisability of an early blowing out.

The scrap market is extremely weak in nearly all centers, the latest declines ranging from 50c. to \$2 per ton.

In spite of recent curtailment of Connellsville coke output, supply still exceeds demand, and spot coke has sold down to \$3.75. More ovens are going out and the decline seems about at an end.

Pig iron at \$23.54, according to THE IRON AGE composite price, is nearly \$7 below the figure one year ago and is at the lowest point in 17 months.

## Pittsburgh

### Shipments of Steel Products Still Exceed Orders—Pig Iron Prices Not Tested

PITTSBURGH, Oct. 16.—While steel orders in a number of directions have shown some increase numerically in the past week, they have not been sufficiently large individually to materially defer the time when most manufacturers must seek business to maintain economic plant operations. Shipments of practically all products still are running well ahead of incoming orders. Demand for standard pipe holds up remarkably well and makers of tin plate are well supplied with business, but otherwise matters are quiet notwithstanding the recent announcement of railroad programs for buying rolling stock, and reports that the



## A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Oct. 16, 1923	Oct. 9, 1923	Sept. 18, 1923	Oct. 17, 1922
No. 2X, Philadelphia...	\$24.26	\$24.76	\$26.26	\$33.14
No. 2, Valley furnace...	24.00	24.00	25.00	32.50
No. 2, Southern, Cin'ti...	24.05	25.05	26.05	31.55
No. 2, Birmingham, Ala...	20.00	21.00	22.00	27.50
No. 2 foundry, Chicago*	25.00	25.00	27.00	31.00
Basic, del'd, eastern Pa...	24.50	24.50	25.00	29.50
Basic, Valley furnace...	24.00	24.00	25.00	30.00
Valley Bessemer, del. P'gh.	26.76	27.26	28.26	35.27
Malleable Chicago*	25.00	25.00	27.00	31.00
Malleable Valley	23.50	24.00	24.50	33.00
Gray forge, Pittsburgh...	25.26	25.26	25.76	32.77
L. S. charcoal, Chicago...	30.04	30.04	32.15	36.15
Ferromanganese, furnace...	110.00	110.00	110.00	67.50

### Rails, Billets, Etc., Per Gross Ton:

	Oct. 16, 1923	Oct. 9, 1923	Sept. 18, 1923	Oct. 17, 1922
O.-h. rails, heavy, at mill...	\$43.00	\$43.00	\$43.00	\$43.00
Bess. billets, Pittsburgh...	40.00	40.00	42.50	40.00
O.-h. billets, Pittsburgh...	40.00	40.00	42.50	40.00
O.-h. sheet bars, P'gh...	42.50	42.50	42.50	40.00
Forging billets, base, P'gh.	47.50	47.50	47.50	45.00
O.-h. billets, Phila...	46.17	45.17	47.67	45.17
Wire rods, Pittsburgh...	51.00	51.00	51.00	45.00
	Cents	Cents	Cents	Cents
Skelp, gr. steel, P'gh, lb...	2.40	2.40	2.40	2.00
Light rails at mill...	2.25	2.15	2.15	2.00

### Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia...	2.67	2.67	2.67	2.475
Iron bars, Chicago...	2.40	2.35	2.40	2.50
Steel bars, Pittsburgh...	2.40	2.40	2.40	2.00
Steel bars, Chicago...	2.50	2.50	2.50	2.10
Steel bars, New York...	2.74	2.74	2.74	2.34
Tank plates, Pittsburgh...	2.50	2.50	2.50	2.15
Tank plates, Chicago...	2.60	2.60	2.60	2.20
Tank plates, New York...	2.84	2.84	2.84	2.34
Beams, Pittsburgh...	2.50	2.50	2.50	2.00
Beams, Chicago...	2.60	2.60	2.60	2.20
Beams, New York...	2.84	2.84	2.84	2.34
Steel hoops, Pittsburgh...	3.15	3.15	3.15	2.90

\*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

Sheets, Nails and Wire,	Oct. 16, 1923	Oct. 9, 1923	Sept. 18, 1923	Oct. 17, 1922
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh.	3.75	3.75	3.75	3.50
Sheets, galv., No. 28, P'gh.	5.00	5.00	5.00	4.50
Sheets, blue an'd, 9 & 10	3.00	3.00	3.00	2.60
Wire nails, Pittsburgh...	3.00	3.00	3.00	2.70
Plain wire, Pittsburgh...	2.75	2.75	2.75	2.45
Barbed wire, galv., P'gh...	3.80	3.80	3.80	3.35
Tin plate, 100-lb. box, P'gh.	\$5.50	\$5.50	\$5.50	\$4.75

### Old Material, Per Gross Ton:

Carwheels, Chicago...	\$17.50	\$18.00	\$20.00	\$25.00
Carwheels, Philadelphia...	20.00	20.50	21.00	23.00
Heavy steel scrap, P'gh...	16.00	16.00	18.00	21.50
Heavy steel scrap, Phila...	15.00	16.00	16.50	18.00
Heavy steel scrap, Ch'go...	14.00	14.50	16.25	18.50
No. 1 cast, Pittsburgh...	19.50	20.00	22.00	24.00
No. 1 cast, Philadelphia...	19.50	19.50	21.50	23.00
No. 1 cast, Ch'go (net ton)	19.00	19.00	20.00	21.00
No. 1 RR. wrot. Phila...	17.50	19.00	20.00	22.00
No. 1 RR. wrot. Ch'go (net)	13.00	14.00	15.50	17.75

### Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt...	\$3.75	\$4.00	\$4.25	\$10.00
Foundry coke, prompt...	4.75	4.75	5.25	12.00

### Metals,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York...	13.12½	13.00	14.00	14.12½
Electrolytic copper, refinery	12.62½	12.75	13.37½	13.62½
Zinc, St. Louis...	6.30	6.30	6.45	6.85
Zinc, New York...	6.65	6.65	6.80	7.20
Lead, St. Louis...	6.60	6.65	6.80	6.35
Lead, New York...	6.85	6.85	7.12½	6.65
Tin (Straits), New York...	41.50	42.25	41.50	34.50
Antimony (Asiatic), N. Y.	7.50	7.50	7.50	6.75

### Composite Price Oct. 16, 1923, Finished Steel, 2.775c. Per Lb.

Based on prices of steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets	Oct. 9, 1923, 2.775c. Sept. 18, 1923, 2.775c. Oct. 17, 1922, 2.460c. 10-year pre-war average, 1.689c.
These products constitute 88 per cent of the United States output of finished steel	

### Composite Price Oct. 16, 1923, Pig Iron, \$23.54 Per Gross Ton

Based on average of basic and foundry irons, the basic being Valley quotation, the foundry an average of Chicago, Philadelphia and Birmingham	Oct. 9, 1923, \$23.79 Sept. 18, 1923, 25.04 Oct. 17, 1922, 30.27 10-year pre-war average, 15.72
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Ford Motor Co. is negotiating for a large tonnage of automobile steel with the Carnegie Steel Co.

Published quotations remain practically where they have been for several weeks past, but this cannot be presented as evidence of strength, since there are sufficient deviations, notably in sheets, to warrant the suggestion that buyers are having more to say about selling prices than was recently the case. Weakness in the primary materials is still unchecked. As low as \$3.75 has been done on furnace coke, while a continued lack of interest on the part of melters is reflected in further declines in scrap iron and steel prices. There has been one sale of basic iron at \$22, Valley furnace, this through a middleman, believed to have sold the market short to this extent, and while producers are not willing to go that low, their asking price of \$24 on this grade does not appear to be obtainable. The market is at least 50c. a ton lower on malleable and Bessemer.

Steel works operations in this and nearby districts are holding at about the recent gait, with the Carnegie Steel Co. operating close to 90 per cent of ingot capacity and the independents about 70 per cent.

**Pig Iron.**—It is doubtful whether trading ever before was so nearly at a standstill as it has been in the past week. Even the small lot tonnages of foundry iron, which come out in all kinds of markets have been exceedingly few. There has been practically no demand for the steel making grades and just where prices actually are puzzles even those most actively identified with the trade. No. 2 foundry and basic iron still are quoted at \$24, Valley furnace, but no business has developed at that level. This is not surprising in view of the fact that Valley furnaces now are having stiffer competition from outside furnaces with more favorable freight rates to destination points and an inclination on the part of the latter to go to prices at which sales can be made. Foundry iron has been bought at the equivalent of \$23 to \$23.50, Valley furnace, and so long as iron is available that low the quotation of the Valley furnaces is mostly an asking price. We note a sale of 100 tons of No. 3 foundry at \$23.50, Valley furnace, but it is doubtful if that price could be repeated. We reduce our quotation of Bessemer iron to a minimum of \$25, Valley furnace, as that price recently was quoted on a small in-

quiry. There is considerable pressure to sell malleable iron and very low prices have been quoted. This grade has been offered at \$23.50, Valley furnace, without takers. A small lot of low phosphorus iron has been sold at \$30, Valley furnace.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being \$1.76 per gross ton:

Basic .....	\$24.00
Bessemer .....	\$25.00 to 25.50
Gray forge .....	23.50
No. 2 foundry .....	24.00
No. 3 foundry .....	23.50
Malleable .....	23.50
Low phosphorus, copper free.....	30.00

**Ferroalloys.**—Activity still is lacking in ferroalloys in this market, although domestic producers claim to have taken a few small tonnages of ferromanganese for early delivery and that a few first quarter of 1924 contracts have been entered, all at \$110, Atlantic seaboard. British producers still are quoting \$117.50, but sales at that figure are out of the question, with domestic material so much cheaper and seemingly the only reason why British producers have not reduced the price is the expectation that settlement of the Ruhr situation will mean a strong continental European demand. Quotations on spiegeleisen are unchanged, but it is well established that the higher figure is hard to obtain, except possibly on small tonnages. Interest in 50 per cent ferrosilicon still is low and prices are indeterminate because there are so few sales. Prices are given on page 1085.

**Semi-Finished Steel.**—There is no quotable change in prices. The undertone of the market is soft, since activity in finished products, notably black sheets, is not sufficient to produce much demand and specifications against contracts are in few instances up to the usual quotas of the nonintegrated manufacturers. It is intimated that less than \$42.50, Pittsburgh or Youngstown, is being done, but positive evidence is lacking, although if there is a substantial basis for claims that there is only a slender margin of profit for the sheet makers who buy their sheet bars with sheets at current prices, that price is high and with billets and slabs to be had at \$40, buyers have an additional argument in favor of lower prices, especially as producing costs are pretty nearly the same. It is still claimed that forging billets are fetching \$47.50 base. The skelp market locally is untested and the price merely nominal. A slight betterment in orders for wire rod products is reflected in rod orders and specifications and prices are somewhat steadier than they have been. The Carnegie Steel Co. maintains the recent rate of ingot production of close to 90 per cent, but the independent rate in this and nearby districts is hardly above 70 per cent. Some of the independent steel makers recently reduced sharply their ingot mold specifications; this ordinarily is a clear forecast of what is ahead in steel works operations. Prices are given on page 1085.

**Plates.**—The Carnegie Steel Co. has a fairly substantial backlog, but with the independents shipments against old orders considerably exceed fresh purchases, and the need of orders will be more pressing if the mills' schedules are to be kept up. We note no shading of the regular base of 2.50c. by local mills. Prices are given on page 1084.

**Wire Products.**—Some manufacturers are doing well, while others do not find orders to be coming along as well as recently. The more general condition of business is that both jobbers and manufacturers are placing orders rather than contracts, the idea being to keep stocks well in hand. Prompt deliveries are being promised by most makers on practically all products and so long as there is no immediate prospect of higher prices, the incentive to large forward buying is lacking. Locally, there is close observance of quoted prices, but as is not uncommon in markets like the present one, there is some shading by Middle Western makers of prices of coated nails. Bright nail obligations are not especially heavy just now, but production keeps up, as the mills are not carrying big stocks and can afford to add to them. Prices are given on page 1084.

**Steel Rails.**—Regular producers of light rails, rolling them from new steel, still insist that on such business as they are getting, the price is 2.25c., base. It is asserted that a quotation of 2.15c., base, would not bring orders in competition with rerolled light rails, which have lately sold as low as 1.85c., base, in eastern Pennsylvania, and costs do not permit meeting such a price by new steel rail makers.

We quote light rails rolled from new steel at 2.25c. base (25-lb. to 45-lb.); those rolled from old rails, 1.85c. to 2c. base (12-lb. to 45-lb.), f.o.b. mill; standard rails, \$43 per gross ton mill, for Bessemer and open-hearth sections.

**Tubular Goods.**—Most makers of steel pipe have enough business to keep them running at a relatively high rate over the remainder of the year and there is not so much concern over the current lack of demand from the oil industry that there otherwise might be. Business keeps up in standard pipe in good shape and reports as to the stocks of pipe in the oil producing sections encourage the belief that the mills will feel promptly any material betterment in the oil situation. In some fields it is said that refiners now are taking all oil offered instead of prorating their acceptances. Another favorable indication is that production is declining in the gusher fields. The supply situation, however, still is unfavorable to any immediate increase in drilling operations. Movement of standard wrought iron pipe is good, but makers are more dependent upon new orders than are the makers of this class of steel pipe. There is still better movement in boiler tubes against old than new business. Generally, quotations are well observed by producers, although there is some shading in boiler tubes. Discounts are given on page 1084.

**Sheets.**—With increasing reports of price cutting and few of the independent manufacturers making much pretense of holding out for 3.85c., base, for black sheets, buyers are encouraged to look for lower prices on all finishes and to move cautiously in the matter of purchases. The leading interest now is taking business for early delivery, since there is not the pressure there was a short time ago for shipments against old orders. This company last week operated close to 90 per cent of its sheet mills and is scheduled at that rate for this week. The sheet industry as a whole is averaging about 70 per cent. Prices are given on page 1084.

**Tin Plate.**—New features are lacking. Production over the remainder of the year has been pretty well spoken for and the attention of the trade is directed toward the requirements of the early part of 1924. Present indications point to a big demand, and unless there is a drop in the price of sheet bars, it is probable that the present base of \$5.50 per base box, Pittsburgh, for standard cokes, will be continued.

**Cold-Finished Steel Bars and Shafting.**—Orders are in fairly good volume, with some demand now appearing from the textile machinery manufacturers, but no claim is made that new business is equal to completed orders, save in the case of some manufacturers whose shipments have been restricted by requests for later deliveries. The official quotation still is 3.25c., base, Pittsburgh, but the market is not solid in all consuming districts at that figure; indeed, in Detroit, where competition for business is keen, 3c., base, is a fairly common price. Ground shafting is unchanged at 3.65c., base, f.o.b. mill, but that price is an "official" price.

**Iron and Steel Bars.**—A fair number of small lot orders for steel bars are coming to makers, but the aggregate still falls considerably short of making good in completed business. Mills in this territory are holding firmly at 2.40c. base and not meeting lower equivalent prices made by mills in other districts. There is no easing in iron bar prices.

We quote soft steel bars, rolled from billets, at 2.40c. base; bars for cold-finishing of screw stock analysis, \$3 per ton over base; reinforcing bars, rolled from billets, 2.40c. base; refined iron bars, 3.25c. base, in carload lots or more, f.o.b. Pittsburgh.

**Hot-Rolled Flats.**—This line is extremely slow of sale and those makers holding firmly to the regular base of 3.15c. are not faring very well in the distribu-



tion of such business as is coming out. That base implies a price of 3c. for rim stock and hot-rolled strips for cold-rolling, but the report is persistent that less than 3c. is being done on rim stock and on the wider sizes of strips. Maintenance of 3.15c. base as a price seems to be due to a belief that a reduction would not create business. Prices are given on page 1084.

**Cold-Rolled Strips.**—Business could be better, but on such as is coming out, no particular difficulty has been experienced by local makers in getting the quoted price of 5c., base, Pittsburgh.

**Structural Material.**—Structural shops in this district are experiencing the lull in orders common to this time of the year, and their bookings are running entirely to jobs involving only very small tonnages. Demands upon the mills for plain material are correspondingly small, and very prompt deliveries now are promised by all of the mills. There is no evidence that the regular price of 2.50c. for large structural shapes is being shaded by local mills. Prices are given on page 1084.

**Bolts, Nuts and Rivets.**—Conditions still are favorable to buyers, chiefly because there are so many makers who want a share of the passing business which is not sufficient to go around. Bolts are pretty well down to 60 and 10 per cent off list for large machine bolts, although the quotation of 60 and 5 has not been officially withdrawn by makers here. Large rivets still are quotable at \$2.75 to \$3 base per 100 lb., but on large orders running chiefly to one size as low as \$2.75 has been done. Prices and discounts given on page 1084.

**Track Supplies.**—Much irregularity still exists in spike prices, notably in the smaller sizes, but local makers still insist that they are not meeting the lower prices, which are said to have been made by Eastern makers. Few inquiries of a size to induce price concessions are coming out. Prices given on page 1084.

**Old Material.**—There has been no change in the attitude of consumers toward the market and with the steel manufacturers well stocked with pig iron and looking toward a period of lighter steel works operations, expectations among dealers of an early revival of scrap buying are fading. Most of the dealers are working for lower prices in an effort to secure cheap yard material and with the consumers largely out of the market, they are having some success in that direction, since in the lack of consumptive buying they make the prices on material coming out. A Pittsburgh district steel maker is reported to have recently paid about \$15.50 for a small tonnage of compressed sheet scrap, but ordinary material of this grade cannot now be moved above quotations. Foundry grades and specialties are suffering in price due to lack of demand. Norfolk & Western Railway will take bids until noon, Oct. 17, on 25,561 gross tons of scrap iron and steel, the list including 12,000,000 lb. of old car wheels. The huge size of this list is explained by the fact that much material offered in last month's list could not be sold at a satisfactory price and was withdrawn.

We quote for delivery to consumers' mill in the Pittsburgh and other districts taking the Pittsburgh freight rate as follows:

Per Gross Ton	
Heavy melting steel.....	\$16.00
No. 1 cast, cupola size.....	19.50 to 20.00
Rails for rolling, Newark and Cambridge, Ohio; Cumberland, Md.; Huntington, W. Va., and Franklin, Pa.....	17.50 to 18.00
Compressed sheet steel.....	14.50 to 15.00
Bundled sheets, sides and ends..	13.00 to 13.50
Railroad knuckles and couplers..	20.50 to 21.00
Railroad coil and leaf springs..	20.50 to 21.00
Low phosphorus bloom and billet ends.....	21.50 to 22.00
Low phosphorus plate and other material.....	20.50 to 21.00
Railroad malleable.....	19.00 to 19.50
Steel car axles.....	19.00 to 19.50
Cast iron wheels.....	18.00 to 18.50
Rolled steel wheels.....	20.50 to 21.00
Machine shop turnings.....	11.50 to 12.00
Sheet bar crops.....	17.50 to 18.00
Heavy steel axle turnings.....	14.50 to 15.00
Short shoveling turnings.....	12.50 to 13.00
Heavy breakable cast.....	17.00 to 17.50
Stove plate.....	14.00 to 14.50
Cast iron borings.....	13.00 to 13.50
No. 1 railroad wrought.....	13.00 to 13.50
No. 2 railroad wrought.....	16.00

**Coke and Coal.**—Although there has been a considerable curtailment of the Connellsville production of coke, supplies still exceed the demand and sale of the surplus is possible only at prices which it is claimed are at least 50c. a ton below actual producing costs. Spot furnace grade is quotable this week from \$3.75 to \$4 per net ton at oven, and spot foundry coke at from \$4.75 to \$5.50. There is a belief that the market is close to a bottom, as large numbers of ovens daily are going out and barring further blast furnace suspensions it is reported the coming week will find a more nearly even balance between production and consumption. The coal market is as weak as ever, despite efforts to bring about a better relation between supply and demand through curtailed production. Mine run steam coal is priced anywhere from \$1.50 for West Virginia coal to \$2.15 from mines located on the Panhandle road. Mine run coking coal takes a range from \$1.85 to \$2.25, and gas grade \$2 to \$2.25. Slack grade coal ranges from 95c. to \$1.25.

### Coke Production Declines

WASHINGTON, Oct. 16.—Production of coke in by-product ovens continued to decline slowly during September, says the Geological Survey. The total output for the month was 3,112,000 net tons. The daily output was 103,729 tons, as against 104,402 tons in August, a decrease of 0.7 per cent. Of the 70 plants, 65 were in operation and five were idle. The coke produced was 85.8 per cent of the present capacity of all the plants.

Production from beehive ovens also declined. The month's output of beehive coke is estimated at 1,373,000 tons, as against 1,494,000 tons in August. The total output from both types of ovens declined from 4,733,000 to 4,485,000 tons.

The decreased activity in coke manufacture reflected in part a decline in the output of pig iron and steel, in part the settlement of the anthracite strike.

### A New Electric Steel Furnace

Holcroft & Co., Detroit, have recently entered the electric steel furnace field by putting on the market a new 3-phase furnace for steel melting and refining. It will be offered in sizes from 100 lb. for laboratory use up to 10-ton units for commercial operations.

The Massachusetts superior court has authorized the sale of Stevens-Duryea, Inc., Chicopee Falls, Mass., automobiles, for \$450,000, to a syndicate headed by Ray M. Owen, New York, and including Roy Rainey, who is identified with coke and steel industries. The syndicate ownership dates from July 31. It has not completed plans but will continue to manufacture automobiles. The plant was completed early in 1920, and comprises 32 acres and approximately 250,000 sq. ft. manufacturing space. It has a capacity of 2000 cars annually. Mr. Owen has been prominently identified in the distribution of automobiles during the past twenty-five years.

The Dominion Alloy Steel Corporation, Royal Bank Building, Toronto, may call for bids next month for steel for foundation work for the proposed plant to be erected at Sarnia, Ont. Engineering work will be done by the company's own engineers. George A. Simpson, Charlton Apartments, Hamilton, Ont., is superintendent of building.

Third-quarter bookings of the General Electric Co. declined 20 per cent, dropping from \$84,249,710, for the previous quarter, to \$65,483,549. This compares with \$58,914,620 in the third quarter of 1922. For the nine months ended Sept. 30 orders amounted to \$229,747,304, against \$176,171,194 in the like period of 1922.

## Chicago

### Steel Bookings Show Some Improvement— Pig Iron Market Weak

CHICAGO, Oct. 16.—Prospective railroad buying continues to be the chief point of interest in the market. The Pennsylvania is in the market for 200,000 tons of rails and the Missouri Pacific has distributed orders for over 30,000 tons. Inquiries for track supplies have shown a material increase since the first of the month. Car buying is slow in materializing and while the Southern Pacific and a few other lines have formulated important programs, railroad equipment manufacturers are doubtful whether orders will be placed in any great number before the first of the year. Meanwhile steel bookings of local mills show some slight improvement over those for the same period in September, but on the whole there has been no important change in the situation and new commitments still fall short of current shipments.

Operations have undergone a further recession, the Illinois Steel Co. having temporarily banked two blast furnaces at Joliet pending necessary repairs to the mills at that location. This interest has 21 active stacks out of 27 steel works furnaces and is producing steel at the rate of 90 per cent of ingot capacity. The Inland Steel Co. remains on an 80 per cent basis.

**Pig Iron.**—The market is quiet and weak, and while there have been reports of further concessions in prices, they lack confirmation. In fact, buying is on such a limited scale that prices remain largely untested. The few sales that have been made are largely in small lots ranging from carloads to a few hundred tons. However, 2000 tons of malleable was sold to a Michigan melter for delivery over the remainder of the year. Likewise 750 tons of malleable and 500 tons of foundry were bought by two other Michigan melters. A Wisconsin melter received a quotation of \$19 base, Birmingham, of 5000 tons of foundry, but obtained a better delivered price from Northern sources of supply. This instance illustrates the flexibility of producers when large tonnages are offered. On small lots the minimum on Southern iron is \$20, Birmingham, and some furnaces are holding for \$21. The weakness of the market has been accentuated by the appearance of small tonnages of resale material, which are generally offered at less than current furnace quotations. Pending inquiries include 1000 tons of foundry and malleable wanted by a Racine melter and a similar tonnage asked for by a Milwaukee user. A small lot of charcoal was sold at 50c. under the market, but whether the material involved was resale or not has not been learned. A small tonnage of low phosphorus has changed hands at \$33.25, delivered Chicago. The Thomas furnace, Milwaukee, which blew out last week, has disposed of its stocks of low phosphorus, but still has malleable to offer. A Wisconsin user has closed for 150 tons of 8 per cent silvery. Foundry operations in this district show considerable variation, some melters being very busy while others are operating part time or are down altogether. The average melt is estimated at from 60 to 70 per cent of capacity.

Quotations on Northern foundry high phosphorus malleable and basic irons are f.o.b. local furnace and do not include an average switching charge of 61c. per ton. Other prices are for iron delivered at consumer's yard or when so indicated, f.o.b. furnace other than local.

Lake Superior charcoal, averaging sil. 1.50, delivered at Chicago..	\$30.04 to \$30.15
Northern coke, No. 1, sil. 2.25 to 2.75 .....	25.50 to 26.50
Northern coke, foundry, No. 2 sil. 1.75 to 2.25 .....	25.00 to 26.00
Malleable, not over 2.25 sil. ....	25.00 to 26.00
Basic .....	25.00 to 26.00
High phosphorus .....	25.00 to 26.00
Southern No. 2 .....	26.01 to 27.01
Low phos., sil. 1 to 2 per cent, copper free .....	33.25 to 34.00
Silvery, sil. 8 per cent .....	39.29

**Ferroalloys.**—As resale lots of ferromanganese are being absorbed prices are stiffening. The most recent sales were at \$110, seaboard, and it is said that cannot

now be done. British producers, of course, are holding at \$117.50, seaboard, but as yet are not getting any business. Spiegeleisen has been weak, but is expected to strengthen in view of the fact that the low seller has disposed of most of his stocks.

We quote 80 per cent ferromanganese, \$117.50, delivered; 50 per cent ferrosilicon, \$85 to \$87, delivered; spiegeleisen, 18 to 22 per cent, \$45, delivered.

**Plates.**—In view of the large amount of railroad car business in prospect mills look for heavy plate orders in the current quarter. Meanwhile, pending the actual placing of that business, mill bookings still fall short of shipments. Commitments thus far in October, however, are larger than those undertaken during the same period in September. No new orders or inquiries for oil storage tanks are reported. Local plate prices are holding firmly.

The mill quotation is 2.60c., Chicago. Jobbers quote 3.30c. for plates out of stock.

**Cast Iron Pipe.**—While \$49 Birmingham still appears to represent the ruling market on water pipe in sizes above and including 6-in., some business has gone at less than that figure, indicating increasing pressure on the part of sellers to obtain new tonnage. Detroit has divided 500 tons between the Lynchburgh Foundry Co. and the National Cast Iron Pipe Co. Part of this was Delavaud pipe made by the centrifugal method, which is approximately 20 per cent lighter foot per foot than other cast pipe. Shops making the Delavaud pipe are just getting on a production basis and it is probable that they will soon announce separate prices for that product, which will be higher than those for the older type of pipe. St. Louis has awarded 1000 tons of 6-in. to the Hammond-Byrd Iron Co. Lake County, Ohio, has placed 1200 tons with the United States Cast Iron Pipe and Foundry Co. subject to the floating of necessary bonds. Tulsa, Okla., will take bids Oct. 26 on 2500 tons of 30- and 42-in. Spring Wells, Mich., will take figures Oct. 17 on 700 tons of 6- and 8-in.

We quote per net ton, f.o.b. Chicago, as follows: Water pipe, 4-in., \$61.20; 6-in. and above, \$57.20; class A and gas pipe, \$5 extra.

**Sheets.**—A local mill has booked 3000 tons of black and galvanized sheets for Japan. This material is for December and January shipments, whereas many of the current Japanese inquiries call for earlier deliveries than this producer is able to make. This Japanese tonnage consists largely of very light gage material in 30 to 36 in. widths, which in times of pressing demand would be classed as undesirable by American mills. Besides a considerable quantity of sheets, bars and plates are also sought by Japan. Domestic buyers of sheets are still proceeding cautiously, pending a change in the market situation. While by shopping around consumers can find smaller producers who will sell at concessions, the larger mills are holding tenaciously to their prices.

Mill quotations are 3.75c. to 3.85c. for No. 28 black, 3c. for No. 10 blue annealed and 5c. for No. 28 galvanized, all being Pittsburgh prices, subject to a freight rate to Chicago of 34c. per 100 lb.

Jobbers quote, f.o.b. Chicago, 4.35c. for blue annealed, 5.20c. for black and 6.35c. for galvanized.

**Bolts and Nuts.**—With jobbers and railroads still hesitant about placing fourth quarter contracts, sellers' ideas of discounts are growing more liberal. On large machine bolts and small bolts with cut threads 60 and 10 per cent off is the common discount, while on small machine bolts with rolled threads 60 and 10 and 10 off is freely available. On carriage bolts 60 off is being done on cut threads and larger, and 60 and 10 off on small with rolled threads. On small rivets 65 and 10 and 5 is the usual quotation. All of these discounts are on the basis of f.o.b. Chicago.

Jobbers quote structural rivets, 4c.; boiler rivets, 4.20c.; machine bolts up to  $\frac{3}{4}$  x 4 in., 45 and 5 per cent off; larger sizes, 45 and 5 off; carriage bolts up to  $\frac{3}{4}$  x 6 in., 40 and 5 off; larger sizes, 40 and 5 off; hot pressed nuts, squares and hexagons, tapped, \$2.50 off; blank nuts, \$2.50 off; coach or lag screws, gimlet points, square heads, 50 and 5 per cent off.

**Rails and Track Supplies.**—The attitude of railroad purchasing agents has undergone a change since Oct. 1,



and this has been manifested particularly in connection with inquiries for track supplies. New inquiries for tie plates, spikes and bolts are large and there is every prospect that they will result in orders. At the same time, the carriers continue to proceed with their rail programs for next year. The Pennsylvania has definitely decided to purchase 200,000 tons, but for a number of other important lines the exact tonnage which will be bought is still undetermined. The Missouri Pacific, however, has placed 14,000 tons of rails with Chicago mills, 10,000 tons with the Colorado mill and 8000 to 10,000 tons with the Tennessee producer.

Standard Bessemer and open-hearth rails, \$43; light rails, rolled steel, 2.25c. f.o.b. makers' mills.

Standard railroad spikes, 3.25c. mill; track bolts with square nuts, 4.25c. mill; iron tie plates, 2.85c. mill; steel tie plates, 2.60c., f.o.b. mill; angle bars, 2.75c., f.o.b. mill.

Jobbers quote standard spikes out of warehouse at 3.90c. base and track bolts, 4.90c. base.

**Structural Material.**—Reluctance to place large contracts for structural work characterizes the attitude of many prospective builders, but numerous small projects continue to go ahead and fabricators generally are still very busy. While the view is held in some circles that the cost of labor and materials is too high, the pressure of improvements is too great to permit sufficient suspension of activity to bring about a recession. In some instances only a part of a project is being undertaken now, in the hope that it may be completed at lower cost later. Bids are now being taken by the Commonwealth Edison Co., Chicago, on about 1000 tons for the foundation and first three stories of a substation building which has been planned to have an eventual height of 22 stories.

The mill quotation on plain material is 2.60c., Chicago. Jobbers quote 3.30c. for plain material out of warehouse.

**Wire Products.**—Buyers are still reticent about ordering ahead, and bookings of the mills continue to fall short of shipments. While current business is not as satisfactory as had been hoped for, it is characterized as between fair and good. Prices are holding and are shown on page 1084.

We quote warehouse prices f.o.b. Chicago: No. 6 to No. 9 bright basic wire, \$3.90 per 100 lb.; extra for black annealed wire, 15c. per 100 lb.; common wire nails, \$3.80 per 100 lb.; cement coated nails, \$3.25 per keg.

**Bars.**—Orders and specifications for soft steel bars from the railroads have shown material improvement since the first of the month. Jobbers and industrial buyers are still marking time, awaiting developments. Total mill bookings for the first half of October, however, show an encouraging gain over the business taken in the same period in the previous month. Actual consumption of bars is holding up well, although some important automobile makers have curtailed operations. The automotive industry, while temporarily less active, is preparing for a resumption of production on a broader scale than ever before, beginning with the new year. The Ford Motor Co., for example, expects to increase its output to 10,000 cars a day. Business in bar iron is still slack, but having failed to stimulate buying through low prices, mills have advanced to a minimum of 2.40c. mill, which, it is said, represents the lowest figure at which they can take orders without sustaining a loss. Rail steel bars are also quiet, although one mill has accumulated enough work to operate at double turn. Hard bar prices are unchanged at 2.30c. mill.

Mill prices are: Mild steel bars, 2.50c., Chicago; common bar iron, 2.40c., Chicago; rail steel, 2.30c., Chicago mill.

Jobbers quote 3.20c. for steel bars out of warehouse. The warehouse quotation on cold-rolled steel bars and shafting is 4.55c. for rounds and 5.05c. for flats, squares and hexagons.

Jobbers quote hard and medium deformed steel bars at 2.75c. base; hoops, 4.55c.; bands, 3.95c.

**Reinforcing Bars.**—New business is still of limited volume and competition for tonnage is active. While concessions have not entirely disappeared, sellers are no longer willing to slash their quotations to the extent of incurring sharp losses. In a few instances recently business was taken at a price equivalent to the mill

quotation, thereby depriving the sellers of any margin for warehousing or engineering. Even in holding at 2.75c., warehouse, as compared with the mill price of 2.50c., bar jobbers have an exceedingly slim spread to cover their costs. Recent lettings include:

Elks Memorial building, Chicago, 250 tons to Corrugated Bar Co.

Piper Hotel building, Madison, Wis., 250 tons to Kalman Steel Co.

Illinois State road work, 200 tons to Kalman Steel Co.

Illinois State bridge work, 150 tons to Kalman Steel Co.

Pending business includes:

State Teachers College, Winona, Minn., 250 tons, general contract awarded to J. A. McDonald, Minneapolis.

Capitol Theater, superstructure, Seventy-ninth and Halsted Streets, Chicago, 175 tons.

Commonwealth Edison Co., Chicago, Lake Street substation, 100 tons, bids on general contract to be taken Oct. 15.

Vassar-Swiss Underwear Co., Chicago, 150 tons.

**Old Material.**—Consumers continue to buy sparingly as prices sink still lower. With the market weak in all departments and with nothing in sight to prevent further declines, dealers, like users, are awaiting developments, being disinclined to buy or to sell. In fact, present selling prices do not justify the cost of the sorting and preparation of yard stocks and this work has largely been suspended. Railroad lists, however, are still large, including the Rock Island, 4500 tons; the Wabash, 3700 tons; the Chesapeake & Ohio, 5600 tons; the Chicago & Alton, 1300 tons; the Chicago Great Western, 1000 tons, and the Soo Line, 700 tons.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton
Iron rails .....	\$19.50 to \$20.00
Cast iron car wheels .....	17.50 to 18.00
Relaying rails, 56 and 60 lb. ....	26.00 to 27.00
Relaying rails, 65 lb. and heavier ..	32.00 to 35.00
Rolled or forged steel car wheels ..	18.00 to 18.50
Rails for rolling .....	15.50 to 16.00
Steel rails, less than 3 ft. ....	17.50 to 18.00
Heavy melting steel .....	14.00 to 14.50
Frogs, switches and guards cut apart .....	14.50 to 15.00
Shoveling steel .....	13.50 to 14.00
Drop forge flashings .....	9.50 to 10.00
Hydraulic compressed sheets .....	11.50 to 12.00
Axle turnings .....	11.00 to 11.50
Steel angle bars .....	16.00 to 16.50

	Per Net Ton
Iron angle and splice bars .....	19.50 to 20.00
Iron arch bars and transoms .....	19.00 to 19.50
Iron car axles .....	24.00 to 24.50
Steel car axles .....	16.00 to 16.50
No. 1 busheling .....	11.00 to 11.50
No. 2 busheling .....	7.50 to 8.00
Cut forge .....	13.00 to 13.50
Pipes and flues .....	8.00 to 8.50
No. 1 railroad wrought .....	13.00 to 13.50
No. 2 railroad wrought .....	12.00 to 12.50
Steel knuckles and couplers .....	17.00 to 17.50
Coil springs .....	18.50 to 19.00
No. 1 machinery cast .....	19.00 to 19.50
No. 1 railroad cast .....	18.00 to 18.50
No. 1 agricultural cast .....	18.00 to 18.50
Low phos. punchings .....	15.50 to 16.00
Locomotive tires, smooth .....	15.00 to 15.50
Machine shop turnings .....	7.00 to 7.50
Cast borings .....	9.50 to 10.00
Short shoveling turnings .....	9.50 to 10.00
Stove plate .....	16.00 to 16.50
Grate bars .....	14.00 to 14.50
Brake shoes .....	15.50 to 16.00
Railroad malleable .....	17.50 to 18.00
Agricultural malleable .....	17.50 to 18.00

Up to the present time, employees of the Western Electric Co., New York, have purchased and are paying on partial payment system for more than 140,000 shares of stock of the company and that of the American Telephone & Telegraph Co., the parent organization, with current value approximating \$18,000,000. About 2000 workers, or 30 per cent of the working force, eligible to take advantage of the plan, are participating.

Sales of the International Harvester Co. this year have shown improvement over those in 1922. In his statement to stockholders President Alexander Legge said: "As compared with 1922, the trade in United States and Canada shows some improvement. Foreign business (excluding Canada) will show an increase in volume of approximately \$10,000,000."

## New York

### Large Structural Work Appearing—Pig Iron Prices Lower

NEW YORK, Oct. 16.—Salesmen who have thoroughly canvassed the Metropolitan district and New England territory during the past week or two report that nearly all foundries are supplied with at least 90 per cent of the iron which they will need for the remainder of this year, and are melting probably 20 per cent less than they did a month or two ago. Under these conditions, it is not surprising that there is very little buying at the present time. Sales last week amounted to probably 5000 tons and prices were very low. No inquiries of importance are pending. The Buffalo price has now touched \$22 and that price has been named for No. 2 plain. In fact, very little attention is being paid to silicon differentials. Prices are also lower in eastern Pennsylvania, where \$23 is now quoted rather freely on No. 2 plain. A number of furnace operators are considering the blowing out of their stacks, but definite announcements are lacking. It is, however, generally believed that there will soon be a sharp curtailment of pig iron production in the East and in Virginia.

We quote delivered in the New York district as follows, having added to furnace price \$2.27 freight from eastern Pennsylvania, \$4.91 from Buffalo and \$5.44 from Virginia:

East. Pa. No. 1X fdy., sil. 2.75 to 3.25....	\$25.77
East. Pa. No. 2X fdy., sil. 2.25 to 2.75....	25.27
East. Pa. No. 2, sil. 1.75 to 2.25.....	25.27
Buffalo, sil. 1.75 to 2.25.....	26.91
No. 2X Virginia, sil. 2.25 to 2.75.....	29.94
No. 2 Virginia, sil. 1.75 to 2.25.....	29.44

**Ferroalloys.**—Demand for ferromanganese is very light and made up of a few carload lots for early delivery. British producers have not reduced their prices from \$115, seaboard, and the opinion is again general that very little resale alloy is now available. The alloy is, however, obtainable from some domestic sources at prices which figure at about \$110. There is very little demand for spiegeleisen which continues to be quoted by the leading producer at \$45 to \$47.50, furnace. There is also very little demand for 50 per cent ferrosilicon, which is quoted at a range of \$82 to \$87 per ton, delivery, depending on the quantity and point of consumption.

**Cast-Iron Pipe.**—Demand has slackened considerably and while makers are well sold up on the smaller sizes, on which prices are firm, some weakness may develop before long on the heavier specifications. Practically no business is expected from New England until after election, and then only feelers on prices for delivery next spring. We quote per net ton, f.o.b. New York, in carload lots, as follows: 6-in. and larger, \$63.60; 4-in. and 5-in., \$68.60; 3-in., \$78.60, with \$5 additional for Class A and gas pipe. The soil pipe market has entered upon the dull season and prices continue weak, although makers are fairly well filled with tonnage for delivery in the next four or five weeks. Concessions of five points more discount are being made on prompt shipment orders, but makers are not inclined to quote for extended delivery. We quote discounts of both Southern and Northern makers, f.o.b. New York, in carload lots, as follows: 6-in., 35% per cent off list; heavy, 45% per cent off list.

**Warehouse Business.**—A noticeable improvement is reported to have occurred in the past week, particularly in the volume of orders, which, however, are still small. On the whole warehouse business seems to have taken a slight upward turn and October is expected to be as satisfactory a month, or better than September. With the exception of sheets, prices continue fairly firm with only isolated instances of shading reported on bars and structural material. Sheets, both black and galvanized, are fairly firm at 4.75c. and 5.75c. per lb., base, respectively, with 5c. and 6c. per lb. quoted for out-of-town delivery. Steel pipe is fairly firm at present discounts, but wrought iron is still being shaded by some dealers. Swedish charcoal iron bars are quoted at 7.25c.

per lb. for small lots, but 7c. per lb. can be done on fair tonnages out of stock. We quote prices on page 1104.

**Finished Iron and Steel.**—The local steel trade continues to take a slightly more hopeful view of the outlook notwithstanding the fact that the inflow of new business is not in keeping with the present rate of shipments from mills. Not only does this optimism spring from the expectations of further railroad car purchases, as mentioned a week ago, but also from the considerable number of structural inquiries now in the market or expected shortly, some of them running into very large tonnages. The New York Telephone Co. work is expected to be out for bids within two weeks. This will be about 18,000 tons. Two other large jobs to be heard from soon are a power plant at Kearny, N. J., for the Public Service Corporation of New Jersey, to require 12,000 to 15,000 tons of steel, and buildings for the Western Electric Co., also at Kearny, which it is estimated will require 10,000 tons or more. Two loft buildings now being figured on for one speculative builder will require a total of 9000 tons, and there is a Coney Island project, thus far not openly figured on, which will take quite a tonnage. Local fabricators say that they have not had so much before them for figures in several months. Construction work also includes quite a lot of concrete reinforcing steel. The Western Electric Co. will require 1000 tons for one of its buildings at Kearny, N. J.; 900 tons will be bought for the American News Co. building, New York, which the Turner Construction Co. will erect; the New York Telephone Co. building takes 200 tons; bids are being asked for on 2000 tons for the Baldwin reservoir extensions in Cleveland; 600 tons are required for a warehouse for the Port Commission, Norfolk, Va., and the Concrete Steel Co. has just been awarded 1100 tons for the Ashley River bridge, Charleston, S. C. No further car inquiries have come into the market, but it is reported that the New York Central Lines will shortly inquire for 25,000 freight cars. The price situation on steel remains unchanged. The larger mills adhere to 2.50c. on plates and shapes and 2.40c. on bars, with some of the smaller mills quoting 2.40c. on plates and shapes. With the exception of slight weakness in black sheets, hot rolled bands and bolts, nuts and rivets, other steel products appear to remain firm at the prices which have existed for fully six months. Orders are almost entirely for small lots for early shipment with the exception of the specific projects in structural steel.

We quote for mill shipments, New York delivery, as follows: Soft steel bars, 2.74c.; plates and structural shapes, 2.84c.; bar iron, 2.74c.

**Coke.**—The coke market is weak with business almost entirely confined to orders for a few carloads for prompt shipment. Standard furnace coke is quotable at from \$4 to \$4.50 per ton, with medium sulphur at about \$3.75 and standard foundry ranges from \$5 to \$6 per ton with some brands up to \$6.50 and \$6.75 per ton. By-product is quoted at \$11.41, Newark and Jersey City, N. J.

**Old Material.**—Prices on most grades are appreciably weaker, although heavy melting steel is still holding at \$15 per ton delivered eastern Pennsylvania consumers, and \$16 for Johnstown with a slightly higher freight rate. So little tonnage is moving from this district that it is difficult to determine current prices. Prices which dealers and brokers are paying for borings and turnings delivered to eastern Pennsylvania consumers figure back to \$7.50 and \$8 per ton here and at points in New England. A fair estimate of the buying price today on clean cast borings is \$9 to \$9.50 and chemical borings have declined steadily to a current price delivered eastern Pennsylvania of \$14.25 per ton. Machine shop turnings are quiet at \$8 to \$8.50 per ton. Some borings and turnings are going forward to consumers at Wierton and Earlston, Pa., but on the whole the market is exceedingly dull. Stove plate is unchanged at \$17.50 to New Jersey foundries, but the price being paid delivered to Harrisburg, Pa., is reported weaker. Specification pipe is off 25c. per ton to \$14.75 per ton delivered Lebanon, Pa. Shipments of



heavy melting steel are going forward to Conshohocken, Coatesville, Pottsville and Bethlehem.

Buying prices per gross ton New York follow:

Heavy melting steel, yard.....	\$11.00 to \$11.50
Steel rails, short lengths, or equivalent .....	12.00 to 12.50
Rails for rolling.....	15.00 to 16.00
Relaying rails, nominal.....	25.00 to 26.00
Steel car axles .....	17.00 to 17.50
Iron car axles .....	25.00 to 26.00
No. 1 railroad wrought.....	14.00 to 14.50
Wrought iron track.....	13.50 to 14.00
Forge fire .....	9.50 to 10.00
No. 1 yard wrought, long.....	13.00 to 13.50
Cast borings (clean).....	9.00 to 9.50
Machine-shop turnings .....	8.50 to 9.00
Mixed borings and turnings.....	7.50 to 8.50
Iron and steel pipe (1 in. diam., not under 2 ft. long).....	10.50 to 11.00
Stove plate .....	13.00 to 14.00
Locomotive grate bars.....	13.50 to 14.50
Malleable cast (railroad).....	17.00 to 18.00
Cast-iron car wheels.....	16.50 to 17.00

Prices which dealers in New York and Brooklyn are quoting to local foundries per gross ton follow:

No. 1 machinery cast.....	\$19.00 to \$19.50
No. 1 heavy cast (columns, building materials, etc.), cupola size .....	18.00 to 18.50
No. 1 heavy cast, not cupola size .....	15.00 to 15.50
No. 2 cast (radiators, cast boilers, etc.) .....	16.00 to 16.50

## Buffalo

### Pig Iron Weak, With Limited Sales—No Interest in 1924 Requirements

BUFFALO, Oct. 16.—Continued weakness in Buffalo pig iron has not served to bring out additional buying and the activity of the last few weeks which indicated a buying movement has disappeared. One new development, however, is that the tendency to get new business through price reduction is not confined to one producer. Up to a few days ago only one interest was going out and meeting competition outside the district, but another furnace is now prepared to make concessions. Several sellers, however, have not joined in the recent price cutting wave and are holding the price \$1 higher than the two interests referred to, and doing no business. Demand is considerably less active and new business does not exceed 12,000 tons. Inquiry has fallen off as well. Buffalo iron makers are not interested in 1924 inquiry, and there has been no movement on the part of consumers to look into the new year situation. Only one foundry has asked prices on first quarter of 1924, and the furnace which received this inquiry declined to quote. Fourth quarter needs appear to be well filled and such new business as appears is for small tonnages. Three furnaces are now quoting \$23 on average business, but \$22.75 has been done in several instances. Reduction of operation in blast furnace circles elsewhere has not spread to the Buffalo district and the same furnace operation is continued, but no one can promise how long this percentage of operation will continue.

We quote f.o.b. gross ton Buffalo as follows:

No. 1 foundry, 2.75 to 3.25 sil.....	\$23.25 to \$23.50
No. 2 foundry, 2.25 to 2.75 sil.....	22.75 to 23.50
No. 2 plain, 1.75 to 2.25 sil.....	22.75 to 23.50
Basic .....	24.00
Malleable .....	24.00
Lake Superior charcoal.....	30.28

**Finished Iron and Steel.**—Demand for all semi-finished material is slower, but prices on all material with the exception of black sheets hold firm. The market on galvanized sheets is undisturbed, but several desirable black sheet tonnages have brought out prices of 3.75c., although the price of 3.85c. which has prevailed for some months is the usual quotation on small lots. Bars are firm at 2.40c., and demand in this product, as well as shapes and plates, is slower. Car builders and other railroad equipment makers are not very active, but there is a prospect of improvement in this class of buying. The demand for pipe is the one outstanding feature of this market.

We quote warehouse prices Buffalo as follows: Structural shapes, 3.65c.; plates, 3.65c.; soft steel bars, 3.55c.; hoops, 4.65c.; bands, 4.35c.; blue annealed sheets, No. 10 gage, 4.45c.; galvanized steel sheets, No. 28 gage, 6.35c.; black sheets, No. 28 gage, 5.25c.; cold rolled round shafting, 4.70c.

**Old Material.**—This market is lifeless and demand is even less than recently. Prices are nominal, and despite the fact that there is no buying a better feeling is in the air. Inspections are rigid and material going out on new orders is closely examined.

We quote f.o.b. gross ton Buffalo as follows:

Heavy melting steel.....	\$16.00 to \$16.50
Low phos., 0.04 and under.....	21.00 to 22.00
No. 1 railroad wrought.....	14.00 to 15.00
Car wheels .....	16.50 to 17.00
Machine shop turnings.....	8.50 to 9.50
Cast iron borings.....	13.50 to 14.50
No. 1 busheling.....	14.50 to 15.00
Stove plate .....	17.00 to 17.50
Grate bars .....	16.00 to 16.50
Bundled sheet stampings.....	8.00 to 9.00
No. 1 machinery cast.....	19.50 to 20.50
Hydraulic compressed .....	14.50 to 15.50
Railroad malleable .....	18.50 to 19.00

## Boston

### Competition Between Northern and Eastern Pennsylvania Furnaces Is Still Keen

BOSTON, Oct. 16.—Competition between northern and eastern Pennsylvania furnaces for business in this territory is still very keen, with Northern iron prices softer than heretofore. Unconfirmed report has it a textile machinery maker the past week bought 1000 tons of York State No. 2X and No. 1X at a delivered price of or very close to \$27, which figures back to approximately \$22, Buffalo furnace. Buffalo iron, which previously sold at \$23, furnace base, with differentials waived, has been offered at \$22.75, or \$27.66 delivered, but the amount of business booked was unimportant. Misleading statements have been made in this territory by foundry owners regarding eastern Pennsylvania iron prices. Differentials have been waived by such furnaces on offers of high silicon iron, whereas foundries in giving out information have deducted these differentials. So far as can be ascertained, no eastern Pennsylvania iron is offered in New England at less than \$23.50, furnace, and most furnaces ask \$24, with and without differentials. A New Hampshire machinery maker is about to close on 100 tons of malleable, 100 tons No. 2X and 100 tons silicon 3.25 to 3.75, a Providence, R. I., foundry on 700 tons of high manganese iron, and another Providence foundry on about 900 tons of No. 2X and No. 1X. No other prospective business of importance is reported, and general opinion among pig iron interests is that sales will be limited the remainder of October.

We quote delivered prices on the basis of the latest reported sales as follows, having added \$3.65 freight from eastern Pennsylvania, \$4.91 from Buffalo, \$5.92 from Virginia, and \$9.60 from Alabama.

East. Penn., sil. 2.25 to 2.75.....	\$27.15 to \$28.15
East. Penn., sil. 1.75 to 2.25.....	27.15 to 27.65
Buffalo, sil. 2.25 to 2.75.....	27.66 to 28.41
Buffalo, sil. 1.75 to 2.25.....	27.66 to 27.91
Virginia, sil. 2.25 to 2.75.....	30.42 to 31.42
Virginia, sil. 1.75 to 2.25.....	30.42 to 30.92
Alabama, sil. 2.25 to 2.75.....	*\$1.10
Alabama, sil. 1.75 to 2.25.....	*\$0.60

\*Nominal.

**Coke.**—In contrast with conditions prevailing in the Connellsville coke market, New England producers of by-product foundry coke the past week or ten days have secured premiums of 50c. to \$1 a ton on car lot prompt shipment fuel from buyers not protected by contracts. Shipments against contract continue to be made on a basis of \$13.50 delivered in New England. With October half gone, shipments against September specifications have not been completed, in some instances due to the continued pressure on coke producers to supply an urgent domestic fuel demand. Connellsville foundry coke is offered at prices far below those quoted on local, but iron melters display little interest, no sales of importance being recorded since last reports.

**Old Material.**—Business in old material is so dull that some of the largest dealers gave employees an extra holiday last Saturday in addition to Columbus day. Offerings of heavy melting steel at \$12 are increasing, but mills apparently are not interested; consequently lower prices are expected. Borings and turnings also are coming into the market in larger quantities.

ties, with almost no takers, and while not actually lower, the market is decidedly unsettled. On the other hand, there is a still further improvement in the demand for No. 1 machinery and textile cast. The latter is in limited supply with holders generally demanding 1c. a pound. No. 1 machinery is selling in car lots mostly at \$22.50 and \$22.75, with some rejections due to faulty loading.

The following prices are for gross ton lots delivered consuming points:

No. 1 machinery cast.....	\$22.00 to \$23.00
No. 2 machinery cast.....	20.00 to 21.00
Stove plate .....	16.50 to 17.00
Railroad malleable .....	22.00 to 22.50
Street car axles .....	20.00 to 21.00

The following prices are offered per gross ton lots f.o.b. Boston common rate shipping points:

No. 1 heavy melting steel.....	\$11.50 to \$12.00
No. 1 rail wrought.....	13.00 to 13.50
No. 1 yard wrought.....	11.50 to 12.00
Wrought pipe (1-in. in diam., over 2 ft. long) .....	10.50 to 11.00
Machine shop turnings .....	7.50 to 8.00
Cast iron borings, rolling mill...	8.50 to 9.00
Cast iron borings, chemical.....	10.50 to 11.00
Blast furnace borings and turnings .....	7.50 to 8.00
Forged scrap and bundled skeleton .....	8.50 to 9.00
Shafting .....	17.50 to 18.00
Street car axles .....	18.00 to 18.50
Rails for rerolling .....	13.50 to 14.00

## Birmingham

### Pig Iron Lags with Wide Difference in Quotations for Local and Distant Shipment

BIRMINGHAM, ALA., Oct. 16.—The Southern pig iron market is still lagging, numerous sales, small lots, still aggregating less than the make, and the quotations are uncertain, ranging from \$20 to \$24. Local melters who are buying in car lots say that they are being called upon to pay \$24 per ton, No. 2 foundry, while reports from the Middle West, where competition is met with furnace interests of the North, are to the effect that iron is being shipped from here on a \$20 per ton base. Even a lower price has been rumored. A few sales of 500 tons have been made recently, but not many, and a little iron goes to the surplus stock from week to week. The local melt is not improving any; in fact, there is a slight reduction. The pressure pipe plants are still operating to capacity, but sanitary pipe and fittings producers are not doing so well and some of the larger foundries and machine shops are without contracts sufficient to keep them going steadily. The lead of the Woodward Iron Co. in reducing cost of production is not commented on, so far as can be learned, though it is generally understood there is to be a similar move made at once by the iron-making companies of the district.

We quote per gross ton f.o.b. Birmingham district furnace as follows:

Foundry, silicon, 1.75 to 2.25.....	\$21.00
Basic .....	22.00
Charcoal, warm blast .....	33.00

**Cast Iron Pipe.**—Lettings the past week with the three large cast iron pipe making companies of this district were smaller than they have been for some time. Some disappointment is expressed on the loss of the order for 4000 tons of pipe at Los Angeles, Cal., the business being awarded a French manufacturer of pipe. This pipe will be made at Pont-à-Mousson, France, and will be shipped to Los Angeles through the Panama Canal. No change in cast iron pipe quotations is noted, but it is admitted that there are concessions on tonnages. Pipe consumers are looking for lower prices owing to the fall of the pig iron market.

**Coke.**—The coke market is very dull and some tonnage is bound to go to the yards if the production is maintained and no new business comes in. Quotations are weak, around \$7.50 per ton, foundry coke, and consumers not willing to buy in greater quantity than one car at a time.

**Old Material.**—Dullness pervades the scrap iron and steel market in the Birmingham district. Very little new business is to be noted. Heavy melting steel is absolutely lifeless, the largest melter of the product not being in the market at all. Machine shop turnings and cast iron borings were marked up \$1 each the past

week. Dealers in old material assert that the quotations given are nominal and that melters are able to make their own prices practically.

We quote per gross ton f.o.b. Birmingham district yards, nominal prices, as follows:

Cast iron borings, chemical.....	\$13.00 to \$19.00
Heavy melting steel.....	14.00 to 15.00
Railroad wrought.....	15.00 to 16.00
Steel axles .....	19.00 to 20.00
Iron axles .....	23.00 to 24.00
Old steel rails .....	16.00 to 17.00
No. 1 cast .....	19.00 to 20.00
Tram car wheels .....	18.00 to 19.00
Car wheels .....	17.00 to 18.00
Stove plate .....	16.00 to 17.00
Machine shop turnings.....	8.00 to 9.00
Cast iron borings.....	9.00 to 10.00

## St. Louis

### Pig Iron Weak—Old Material Prices Are Again Reduced

ST. LOUIS, Oct. 16.—The market for pig iron is rather weak, with buying in this district extremely light. Melters are simply waiting to see what will happen in the way of price fluctuations. They seem to feel that the market will go lower, and they are buying only when it becomes absolutely necessary to do so. Such purchases are small. The only inquiry of note is for 1000 tons of foundry iron from a central Illinois melter. Sales of the St. Louis Coke & Iron Co. during the week amounted to 200 tons in carload lots. Its present price is \$26.50 to \$27.50, Granite City. Northern iron is quoted nominally at \$25, Chicago, and Southern iron at \$21, Birmingham.

We quote delivered consumers' yards, St. Louis, as follows, having added to furnace prices \$2.16 freight from Chicago, \$3.28 from Birmingham (rail and water), \$5.17 from Birmingham, all rail, and 81 cents average switching charge from Granite City:

Northern fdy., sil. 1.75 to 2.25.....	\$27.16
Northern malleable, sil. 1.75 to 2.25.....	27.16
Basic .....	27.16
Southern fdy., sil. 1.75 to 2.25 (rail)....	26.17

**Finished Iron and Steel.**—The rail purchases of the Missouri Pacific Railway will total about 30,000 tons, but the allocation will not be determined for at least a week. The delay is said to be due to the fact that some of the rails will be used on Western lines. The contract for 150 tons of reinforcing bars for the Tate Motor Co. building, St. Louis, went to the Laclede Steel Co. Warehouse business is dull.

**Coke.**—A few contracts for last quarter, one for 300 tons, were made for foundry coke during the last week. Makers are disinclined to take on contracts for 1924. Foundry grades are selling at \$6 to \$7.50 at the Connellsville ovens. There is no especial demand for domestic grades, the warmer weather and a more plentiful supply of coal being the cause of the lack of interest.

**Old Material.**—The market for old material showed further weakness during the last week, a decline of \$1 being recorded in all grades except railroad and machinery cast, which are unchanged. There has been no buying whatever by consumers, and trading between dealers small. Railroad lists continue heavy, causing a further weakening influence. New lists include: Chicago & Alton, 1200 tons; Rock Island, 4000 tons, and Wabash, 4000 tons.

#### Per Gross Ton

Iron rails .....	\$15.00 to \$15.50
Rails for rolling.....	16.00 to 16.50
Steel rails, less than 3 ft.....	17.00 to 17.50
Relaying rails, 60 lb. and under...	25.00 to 26.00
Relaying rails, 70 lb. and over...	32.50 to 33.50
Cast iron car wheels.....	17.50 to 18.00
Heavy melting steel.....	14.50 to 15.00
Frogs, switches and guards cut apart .....	15.00 to 15.50

#### Per Net Ton

Heavy axles and tire turnings...	11.00 to 11.50
Steel angle bars.....	13.50 to 14.00
Steel car axles.....	16.50 to 17.00
Iron car axles.....	24.00 to 25.00
Wrought iron bars and transoms .....	18.00 to 18.50
No. 1 railroad wrought.....	13.50 to 14.00
No. 2 railroad wrought.....	13.50 to 14.00
Railroad springs .....	15.00 to 15.50
Cast iron borings.....	9.00 to 9.50
No. 1 railroad cast.....	19.50 to 20.00
No. 1 machinery cast.....	20.00 to 20.50
Railroad malleable .....	15.50 to 16.00
Machine shop turnings.....	9.50 to 10.00
Champion bundled sheets.....	7.00 to 7.50



## Cincinnati

## Pig Iron Prices Shaded Sharply in an Extremely Dull Market

CINCINNATI, Oct. 16.—The market is unusually dull. A sale of 1000 tons to a sanitary company went at about \$23, Ironton. A sale of 600 tons to an Indiana melter is reported to have gone to a lake front furnace on the basis of \$23.50 furnace, or the equivalent of \$23.25 Ironton. Southern Ohio furnaces are reported to have quoted \$23.75 Ironton on this deal, and at least one quotation of \$23 Ironton was made by a broker. An inquiry for 1500 tons from a Kentucky melter had not been closed on Tuesday, but it is expected to go to a southern Ohio furnace. The same melter is in the market for Southern iron, and this probably will be closed this week. Prices generally are weak. Southern Ohio iron can be had in round tonnages at \$23.75, and in the South, while \$21 is the nominal quotation, it is admitted that \$20.50 can be done, and possibly \$20 on large tonnages. Some sellers, however, are of the opinion that the bottom of the market has about been reached, and are looking for an upturn. Inquiry is confined almost entirely to carload lots for immediate shipment. Three furnaces in southern Ohio and northern Kentucky are preparing to blow in, Jisco on silvery and Belfont and Norton on foundry and Bessemer respectively.

Based on freight rates of \$4.05 from Birmingham and \$2.27 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base)	\$24.05 to \$25.05
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	24.55 to 25.55
Ohio silvery, 8 per cent.	36.77
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	25.77
Basic Northern	26.77
Malleable	25.77

**Finished Material.**—A slight improvement is noted in the demand for finished materials, but orders continue to be placed only for one or two carloads for immediate delivery. Prices generally are holding up well. On an inquiry for the Big Four Railroad a Cleveland district mill quoted 2.53c., Cleveland, on ¼-in. and heavier plates. On bars the lowest quotation was 2.40c., Pittsburgh. On forging billets a quotation of \$48.50, delivered Cincinnati, was made by a Kentucky manufacturer. On wire products prices generally followed current prices, although on wire nails a price was quoted of \$3.10 per keg, delivered Cleveland. There is a fair demand for track materials. The L. & N. Railroad will close today for 14,700 kegs of spikes, 5500 kegs of track bolts and 31,000 pairs of angle bars. On spikes 3.15c., Pittsburgh, is reported to have been the general quotation, with Chicago manufacturers quoting a similar price, f.o.b. Chicago.

**Structural Materials.**—A number of large projects came up during the week. The biggest was the Hurt office building, Atlanta, requiring 2500 tons. The Louisville & Nashville Railroad is taking bids on 1600 tons of bridge work for Newport, Ky., and the Big Four and Cincinnati Northern Railroads on 800 tons of plate girder work. Bids will probably be asked about Nov. 1 on the Third National Bank, Dayton, Ohio, and for the Masonic Temple at Portsmouth, Ohio, requiring 300 tons. Revised plans have been sent out for bids for the Hurth Hotel, Portsmouth, Ohio, involving 300 tons. Two school buildings at Piqua, Ohio, 200 tons, are up for figures. There have been no lettings.

**Reinforcing Bars.**—An inquiry for 650 tons of reinforcing bars for St. Joseph's Infirmary, Louisville, Ky., is being figured on. Bids for this project closed Oct. 9, but the contract has not been awarded. A warehouse for the Standard Sanitary Mfg. Co. at Indianapolis will require about 200 tons. Prices generally range from 2.20c. to 2.40c.

**Sheets.**—While it is generally considered that black sheets can be had for 3.75c. or even less, mills in this district have been booking orders right along at the regular price of 3.85c. The tonnages, however, have been light, ranging from one to three carloads. Concessions of \$2 per ton have also been reported on gal-

vanized sheets, but blue annealed sheet prices remain firm at 3c.

**Warehouse Business.**—Orders continue in good volume, though somewhat spotty. Bars, small angles and blue annealed sheets are in most demand, although some wire products are moving fairly well. Cold-rolled steel is also in slightly better demand. Prices are unchanged, and indications point to the maintenance of the present schedules for the remainder of the year.

Cincinnati jobbers quote: Iron and steel bars, 3.50c.; reinforcing bars, 3.60c.; hoops, 4.55c.; bands, 4.25c.; shapes, 3.60c.; plates, 3.60c.; cold-rolled rounds, 4.50c.; cold-rolled flats, squares and hexagons, 5c.; No. 10 blue annealed sheets, 4.25c.; No. 28 black sheets, 5.35c.; No. 28 galvanized sheets, 6.35c.; No. 9 annealed wire, \$3.60 per 100 lb.; common wire nails, \$3.60 per keg base.

**Fluorspar.**—Some small sales of fluorspar are reported at prices unchanged from previous quotations. Some shading is being done by the smaller interests, but prices generally are being well maintained.

**Coke.**—Little activity is noted in foundry coke. We note two contracts for furnace coke, however, of 9000 tons per month each for the next two months, from southern Ohio furnaces, at undisclosed prices. Reports are current of much distress coke, particularly in the Michigan territory. Prices are about the same as last week, Connellsville furnace being quoted at \$4 to \$4.25 and foundry at \$5 to \$7. New River is unchanged at \$12, for foundry; Wise County furnace at \$5.25, and foundry at \$6 to \$7. By-product foundry is quoted at \$9, Connellsville basis. Some ovens are being put out in the West Virginia district.

**Old Material.**—Dealers report a lessened demand each day for scrap. Some small sales are being made, however, but prices are very weak, being at least 50c. lower than the previous week. Offerings are heavy, the Norfolk & Western list being for 35,000 tons.

We quote dealers' buying prices, f.o.b. cars Cincinnati:

	Per Gross Ton
Bundled sheets	\$10.50 to \$11.00
Iron rails	13.50 to 14.00
Relaying rails, 50 lb. and up	37.50 to 28.00
Rails for rolling	14.50 to 15.00
Heavy melting steel	13.00 to 13.50
Steel rails for melting	13.50 to 14.00
Car wheels	13.00 to 13.50

	Per Net Ton
No. 1 railroad wrought	11.50 to 12.00
Cast borings	8.00 to 8.50
Steel turnings	7.50 to 8.00
Railroad cast	14.50 to 15.00
No. 1 machinery cast	17.50 to 18.00
Burnt scrap	11.00 to 11.50
Iron axles	21.50 to 22.00
Locomotive tires (smooth inside)	13.00 to 13.50
Pipes and flues	7.00 to 8.50

## Detroit Scrap Market

DETROIT, Oct. 16.—Mills and furnaces that ordinarily consume a large part of the scrap in this district are following a hand-to-mouth policy on waste material purchases. This is also true of the pig iron melters who are piecing out their contracts until inventory period. The situation is analogous to that of a year ago, with prospects of buying for current needs only over the remainder of the year. Prices are unchanged.

The following prices are quoted on a gross ton basis, f.o.b. cars producers' yards, excepting stove plate, automobile cast and No. 1 machinery cast, which are quoted on a net ton basis:

Heavy melting steel	\$12.00 to \$12.50
Shoveling steel	12.00 to 12.50
No. 1 machinery cast	17.00 to 17.50
Cast borings	10.00 to 11.00
Automobile cast scrap	24.00 to 25.00
Stove plate	16.00 to 17.00
Hydraulic compressed	10.50 to 11.25
Short turnings	10.00 to 11.00
Long turnings	9.00 to 9.50
Flashings	9.50 to 10.00

The measurement of water under almost any conditions as the result of a method devised by Prof. C. M. Allen of the Worcester, Mass., Polytechnic Institute, is announced by the Engineering Foundation, New York. By the use of salt and electricity measurements of remarkable precision are said to be accomplished. Professor Allen's new method is indirect. It is based on the fact that common salt increases the electrical conductivity of water in proportion to the quantity of salt dissolved in the water.

## Cleveland

### Pig Iron Fairly Active in Indiana and Michigan—Dull in Northern Ohio

CLEVELAND, Oct. 16.—Iron ore firms have completed shipments on many of their smaller merchant furnace contracts, but large consumers are still moving ore in good volume. Owing to the cautious buying by many consumers early in the season, there have not been many cancellations of contracts or postponements of deliveries until next season on account of blowing out of blast furnaces.

**Pig Iron.**—Sales increased during the week in Michigan and Indiana and with several orders ranging up to 1500 tons, the market has been fairly active in those States, but in the northern Ohio district business is virtually at a standstill. Prices show no strength, but in the absence of business local furnaces are still naming a \$24 price for foundry and malleable grades for outside delivery. However, an inquiry of sufficient size to test the market would probably bring out lower quotations more in line with Valley prices. In the Valley district, the market is openly quoted at \$23.50 to \$24, but there are unconfirmed reports of \$23 and even lower quotations. Buffalo furnaces appear to be holding to \$23 for some shipping points, but Buffalo iron has been offered in New England at \$22.50. Business in Michigan and Indiana is coming largely from automobile foundries, although the American Radiator Co. purchased 1200 tons of foundry iron for its Detroit plant for prompt shipment. Inquiries for several thousand tons of malleable and foundry iron from the same districts are pending. Southern iron is inactive. We note the sale of two 100-ton lots of low phosphorus iron by a Valley producer at \$30, but this price has been shaded for iron shipped to the Chicago territory. A Cleveland district consumer has placed 3000 tons of standard low phosphorus iron with an Eastern producer at \$28.

Quotations below, except on basic and low phosphorus iron, are delivered Cleveland, and for local iron include a 50c. switching charge. Ohio silvery and Southern iron prices are based on a \$3.02 freight rate from Jackson and \$6 rate from Birmingham:

Basic, Valley furnace.....	\$24.00
Northern No. 2 fdy., sil. 1.75 to 2.25.....	25.50
Southern fdy., sil. 1.75 to 2.25.....	27.00
Malleable.....	25.50
Ohio silvery, 8 per cent.....	37.52
Standard low phos., Valley furnace.....	30.00

**Bolts, Nuts and Rivets.**—The maximum discounts that have been quoted recently on machine and carriage bolts have become more common. A leading Cleveland manufacturer Oct. 13 announced a 5 per cent reduction in its prices to the extreme discounts that have been prevailing and made a 25c. reduction on hot-pressed nuts and also a 5 per cent reduction on semi-finished hex. nuts. The 5 per cent reduction on bolts about offsets the advance that was made in the new price lists recently issued. Some makers are getting a fair volume of business, but others are in need of orders. Considerable rivet business is being booked in fourth quarter contracts by a leading producer at 2.85c. to 3c., but a 2.75c. quotation is still appearing for early shipment orders.

**Semi-finished Steel.**—An inquiry has come out for 5000 tons of sheet bars for Japan, but otherwise the market is lifeless. Sheet bars appear to be held firmly at \$42.50, Youngstown, but billets and slabs can be purchased at around \$40.

**Finished Iron and Steel.**—Mills are getting a fair volume of orders on contracts and there is a moderate volume of inquiry for small miscellaneous lots of steel bars, plates and structural material. Business seems to show a slight gain, particularly in plates. Buyers generally are placing orders for immediate requirements only, feeling that they may secure lower prices later. Prices on steel bars, plates and structural material are firm. While a Cleveland mill was reported to have shaded the regular plate price in a quotation to the Big Four Railroad, this proved incorrect, as the quotation was based on Indianapolis instead of Cleveland delivery and while a 2.53c. Cleve-

land price was named, this figured back to 2.50c. Pittsburgh. Eastern mills are quoting plates at 2.60c., Pittsburgh for this territory, but have shaded this price. Outside of plates, shapes and bars, some price concessions are appearing. The demand for hot-rolled strip steel has become somewhat more active, but prices are still irregular, although some mills are holding to a minimum of 3c. and are making small sales of 3.15c. Cold-finished steel bars lack firmness, the regular prices being shaded \$3 a ton to 3.10c. on good size orders. Spikes also are somewhat irregular, sales being made as low as 3.10c. In the building field, considerable new work continues to come out. Bids were opened today for the Brotherhood of Locomotive Engineers' bank and office building requiring 3000 tons of structural steel.

Jobbers quote steel bars, 3.36c.; plates and structural shapes, 3.46c.; No. 9 galvanized wire, 3.70c.; No. 9 annealed wire, 3.25c.; No. 28 black sheets, 4.40c. to 4.65c.; No. 28 galvanized sheets, 5.50c. to 5.80c.; No. 10 blue annealed sheets, 3.60c. to 4.06c.; cold rolled rounds, 3.90c.; flats, squares and hexagons, 4.40c.; hoops and bands, 1 in. and wider and 20 gage or heavier, 4.16c.; narrower than 1 in. or lighter than No. 20 gage, 4.60c.

**Sheets.**—Demand is rather light and some of the mills are in need of orders. Blue annealed sheets are firm at 3c. and galvanized sheets are holding up well to the regular 5c. price, although some shading is reported. On black sheets 3.75c. is common.

**Reinforcing Bars.**—The Cleveland Water Works Department will receive bids Oct. 24, for an administration building, two filter houses and seven valve houses for the Baldwin Reservoir requiring 2000 tons or more of reinforcing bars. The Ohio State Highway Commission has taken bids for road work requiring 400 tons if concrete construction is decided upon for all the work. Rail steel bars are not firm with 2.20c. as the common quotation. Billet steel bars are quoted at 2.75c., Pittsburgh, but this price is shaded \$2 a ton for desirable orders for early delivery.

**Warehouse Business.**—Weakness has developed in warehouse prices on steel bars, plates and structural material and some business has been taken at around \$2 a ton below regular quotations. Jobbers have recently been getting shipments on low priced steel placed at around \$10 a ton below present mill prices. The weakness in warehouse prices on blue annealed and galvanized sheets recently noted has spread to blue annealed sheets, which can be purchased at 3.60c., or a concession of \$3 a ton.

**Old Material.**—The market is weak owing partly at least to the hold-up of shipments by a leading local consumer and most grades have been reduced 50c. to \$1 a ton. Borings and turnings are particularly weak, having declined \$1 and the latter are being purchased by dealers at \$11 for yard stocks. Mills are buying very little scrap and there is somewhat of a deadlock in the market, dealers claiming that producers are holding their material rather than selling it at prices that consumers are willing to pay.

We quote dealers' prices f.o.b. Cleveland per gross ton:

Heavy melting steel.....	\$15.00 to \$15.25
Rails for rolling.....	18.00 to 18.50
Rails under 3 ft.....	17.00 to 17.25
Low phosphorus melting.....	19.00 to 19.25
Cast borings.....	11.50 to 11.75
Machine shop turnings.....	11.00 to 11.50
Mixed borings and short turnings.....	11.25 to 11.50
Compressed sheet steel.....	13.75 to 14.00
Railroad wrought.....	12.75 to 13.00
Railroad malleable.....	20.00 to 20.50
Light bundled sheet stampings.....	11.50 to 12.00
Steel axle turnings.....	12.00 to 12.75
No. 1 cast.....	20.50 to 21.50
No. 1 busheling.....	10.75 to 11.00
Drop forge flashings.....	11.50 to 12.00
Railroad grate bars.....	16.00 to 16.50
Stove plate.....	16.00 to 16.50
Pipes and flues.....	10.00 to 11.00

Wm. H. Muller & Co., Inc., 11 Broadway, New York, exporter and importer, has been appointed exclusive agent in the United States and Canada of the recently formed Swiss Aluminum Rolling Mills Syndicate. The rolling mills of Switzerland in June formed a syndicate under the name of the Swiss Rolling Mills Association, Ltd., with headquarters at Basel. The products consist principally of aluminum sheets, wire and disks.



## Philadelphia

### Pig Iron and Scrap Show Further Weakness —Steel Demand Light

PHILADELPHIA, Oct. 16.—Further weakness in foundry pig iron and scrap are the chief developments of another week of very light demand. No improvement has taken place in the steel trade, but Eastern plate mills are basing hopes for a revival of plate demand on inquiries from five roads for a total of 200 to 300 locomotives. While the larger steel mills are making every effort to hold prices of plates, shapes, bars and sheets, further weakness in some of these products has come to light. Steel bars are being so freely shipped by one large producer on old orders, with invoice prices ranging from 1.70c. to 2.25c., Pittsburgh, that some resale lots are being offered in the market by either jobbers or consumers at prices considerably below the current mill quotation of 2.40c., Pittsburgh. Black sheets are more freely offered at 3.75c., Pittsburgh, and it appears that quotations of 4.90c., Pittsburgh, have been made on galvanized sheets, which hitherto have held pretty well at 5c.

The outstanding characteristic of all markets is there are no clear indications as to the future. Buyers are plainly convinced that any price changes will be downward and are acting accordingly.

**Pig Iron.**—A test of the foundry iron market was made last week by a large company which had inquired for 2500 tons for its New Jersey plant. Two or three eastern Pennsylvania furnaces were offered all or part of the tonnage at \$22, furnace, but it is stated that the offer was refused in every instance. A part of the business was placed with one furnace, which is said to have realized slightly less than \$23, furnace, on the base grade. Nearly all eastern Pennsylvania furnaces are now quoting \$23, furnace, on No. 2 plain, \$23.50 on No. 2X and \$24 on No. 1X. One sale of No. 2X is reported at \$23.25, furnace. Despite the fact that the market still has all the appearances of further weakness, there is a more definite feeling among sellers that prices are now close to bottom if they have not already reached it. Sales are mostly in small lots for early shipment and furnaces are continuing to pile iron.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia and include freight rates varying from 76 cents to \$1.63 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25	
sil. ....	\$23.76 to \$25.13
East. Pa. No. 2X, 2.25 to 2.75 sil.	24.26 to 25.63
East. Pa. No. 1X, .....	24.76 to 26.13
Virginia No. 2 plain, 1.75 to 2.25	
sil. ....	29.17 to 30.17
Virginia No. 2X, 2.25 to 2.75 sil.	30.17 to 30.67
Basic delivered eastern Pa. ....	24.50 to 25.00
Gray forge .....	24.50 to 25.00
Malleable .....	24.50 to 25.50
Standard low phos. (f.o.b. furnace) .....	28.00 to 30.00
Copper bearing low phos (f.o.b. furnace) .....	28.00

**Ferroalloys.**—Domestic furnaces continue to quote \$112.50 on ferromanganese, but are taking little business, as resale lots at \$108 to \$110 continue to dominate the market. These resale lots, it is stated, are being rapidly cleaned up and producers have hope of a better situation from their point of view.

**Semi-Finished Steel.**—Open-hearth rerolling billets are freely offered at \$40, Pittsburgh, and forging billets at \$45, and it appears that even these prices would be shaded on attractive lots.

**Plates.**—Eastern plate mills have felt a slight improvement in demand for plates, as compared with a few weeks ago, but they are still operating at a very low rate, some of them at not more than 25 per cent. The Pennsylvania Railroad has not released any of the plate tonnage it held up about two months ago, though urged to do so by some of the mills. The price situation remains the same, two of the smaller mills quoting 2.40c. and the others 2.50c., Pittsburgh. As there is not enough business even at 2.40c. to fill up the mills, quoting that price, the situation, from the producers' viewpoint, is discouraging. Prospective car and locomotive buying has raised hopes somewhat, but it is not

yet certain whether the talked-of business will develop in time to give Eastern plate mills the tonnage they need to finish out this quarter. The Baldwin Locomotive Works is bidding on upward of 200 locomotives, of which 58 are for the Southern Pacific, 80 for the Missouri Pacific, 39 for the Louisville & Nashville and the remainder for the Baltimore & Ohio and the Pennsylvania. The Standard Oil Co. of New Jersey has let contracts for eight barges, five of which will be built by the Sun Shipbuilding Co. and three by the New York Shipbuilding Corporation. The plates, about 4000 tons in all, will be rolled by the Carnegie Steel Co.

**Structural Steel.**—Two or three prospective jobs requiring a total of about 5000 tons of steel are expected to be in the market shortly, but at present there are no important projects up for bids in the immediate Philadelphia territory. Two mills continue to quote 2.40c., Pittsburgh, on structural shapes, the others quoting 2.50c. No real test of the 2.40c. price is reported, but buyers believe that 2.35c., Pittsburgh, has been quoted on some lots.

**Bars.**—Though steel bars have been holding well at 2.40c., Pittsburgh, so far as the mills are concerned, a good deal of resale material is being offered for concrete reinforcing purposes. It appears that some jobbers or consumers, it does not appear which, are getting more bars from a large producer on old contracts than they have any immediate use for, and this is the material that is being thrown on the market. Some of this steel is on orders taking prices as low as 1.70c., Pittsburgh, and scarcely any of it is invoiced at more than 2.25c. As long as these buyers had a definite use for the large shipments which have been coming to them in recent weeks, there was no thought of reselling it, but now with the year-end inventory period approaching they are willing to sacrifice it rather than carry it in stock. To meet this competition one or two independent mills have quoted 2.30c., Pittsburgh, but this has not in some instances been low enough. Sales of concrete bars are reported to have been made from 2.15c. to 2.25c., Pittsburgh. Bar iron demand is light and prices are unchanged at 2.35c. to 2.40c., Pittsburgh. Structural rivets are being sharply cut. One Pittsburgh company has made quotations of 2.75c. per lb., Pittsburgh, which is \$5 per ton below quotations of some makers.

**Sheets.**—Quotations of 3.75c., Pittsburgh, on black sheets are more common, and galvanized sheets have been quoted at 4.90c., but blue annealed appears to be firm at 3c. Very little sheet business is being placed with the mills by consumers in this district.

**Warehouse Business.**—Local warehouses are shipping out a very satisfactory volume of steel. Many consumers, regularly mill buyers, are now satisfying their immediate requirements out of jobbers' stocks. Prices are unchanged, and for Philadelphia delivery are as follows:

Soft steel bars and small shapes, 3.55c.; iron bars (except bands), 3.55c.; round edge iron, 3.75c.; round edge steel, iron finished, 1½ x ½ in., 3.75c.; round edge steel planished, 4.55c.; tank steel plates, ¼ in. and heavier, 3.65c.; tank steel plates, ½ in., 3.95c.; blue annealed steel sheets, No. 10 gage, 4.25c.; black sheets, No. 28 gage, 5.15c.; galvanized sheets, No. 28 gage, 6.25c.; square twisted and deformed steel bars, 3.65c.; structural shapes, 3.65c.; diamond pattern plates, ¼-in., 5.40c.; ½-in., 5.60c.; spring steel, 5c.; round cold-rolled steel, 4.35c.; squares and hexagons, cold-rolled steel, 4.85c.; steel hoops, 1 in. and wider, No. 20 gage and heavier, 4.75c.; narrower than 1 in., all gages, 5.25c.; steel bands, No. 12 gage to ½-in., inclusive, 4.35c.; rails, 3.55c.; tool steel, 8.50c.; Norway iron, 7c.

**Ore.**—Receipts of iron ore from abroad last week totaled 30,720 tons, of which 12,400 tons came from French Africa, 9820 from Sweden and 8500 from Newfoundland.

**Old Material.**—Not in a considerable period have there been such sharp declines in prices of various grades of scrap as in the past week. Scarcely an item quoted in the table below has escaped, and the reductions range from 50c. to \$2 a ton. A large buyer of heavy melting steel bought 15,000 tons last week at \$15, delivered. The same consumer also bought a considerable tonnage of blast furnace borings and turnings at \$11.50. One of the principal consumers of

bundled sheets and machine shop turnings for open-hearth use bought 1500 tons at \$12, and then reduced its price to \$11, which is now the maximum that can be obtained. Except for these few transactions, the market is very dull and indications point to further reductions.

We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel.....	\$15.00
Scrap rails .....	15.00
Steel rails for rolling.....	\$17.50 to 18.00
No. 1 low phos., heavy 0.04 and under .....	21.00 to 22.00
Cast-iron car wheels.....	20.00 to 20.50
No. 1 railroad wrought.....	17.50 to 18.00
No. 1 yard wrought.....	16.00 to 17.00
No. 1 forge fire.....	12.50 to 13.00
Bundled sheets (for steel works) .....	11.00 to 11.50
No. 1 busheling.....	14.50 to 15.00
Mixed borings and turnings (for blast furnace use).....	11.00 to 11.50
Machine shop turnings (for steel works use) .....	11.00 to 11.50
Machine shop turnings (for rolling mill use).....	12.00 to 12.50
Heavy axle turnings (or equivalent) .....	13.00 to 14.00
Cast borings (for steel works and rolling mills).....	12.50 to 13.00
Cast borings (for chemical plants) .....	16.00 to 17.00
No. 1 cast.....	19.50 to 20.00
Heavy breakable cast (for steel plants) .....	16.50 to 17.50
Railroad grate bars.....	16.00 to 16.50
Stove plate (for steel plant use) .....	16.00 to 16.50
Railroad malleable .....	18.00 to 19.00
Wrought iron and soft steel pipes and tubes (new specifications) .....	14.50 to 15.00
Shafting .....	20.00 to 21.00
Steel axles .....	20.00 to 21.00

## British Iron and Steel Market

Japan Still Buying Heavy Tonnages of Sheets—

Tin Plate in Strong Demand—Belgium

Secures Chinese Rail Order

(By Cable)

LONDON, ENGLAND, Oct. 16.

There is an improved tone to the pig iron market, though prices as yet are unaffected. Buyers are displaying more interest in forward prices, particularly the Continental consumers. General consumption is increasing and higher prices are looked for in the future.

Hematite is firm. Continental purchasers are rather more active. Foreign ore is dull. Sellers of Bilbao Rubio ask 22½s. (\$5.71) c.i.f. Tees.

Heavy steel is dull, owing to the continuance of the boilermakers' dispute, which is causing shipyard stagnation. There is some Continental inquiry covering shipbuilding material.

September exports of pig iron, excluding ferro-alloys, were 45,015 tons. The total of all iron and steel amounted to 333,985 tons.

William Beardmore & Co., Ltd., Glasgow, has secured a contract from the Latvian Government for a 2800-ton ice-breaker.

Belgium has secured an order from China for 10,000 tons of steel rails.

Continental markets are disorganized by the exchange fluctuations, and little business is moving through traders here.

In Belgium 41 blast furnaces were blowing on Oct. 1.

In Germany the Ruhr works are discharging men wholesale. Operations in the immediate future, therefore, are likely to be restricted.

In Poland a general strike is disorganizing industry.

In Upper Silesia the majority of the mines and works are idle.

Tinplate is in strong demand, particularly with regard to domestic consumers, who are covering for their November-December requirements and some going into January-February. Exports are improving;

Canada is inquiring. The CW 20 x 14's have been fixed at 20s. (\$4.54) f.o.b. for October only.

Galvanized sheets are firm. India is buying on a small scale. Other markets, especially in the Far East, are active. Japan 67's are being sold at £29 10s. (5.98c. per lb.) f.o.b., for January delivery. Thin gage makers are well sold and some are not quoting.

Black sheets are strong on continued Japanese demand. CA 24-gage has been sold at £14 (2.84c. per lb.) f.o.b. Japan 6 x 3, 13's, 107 lb. sheets are bringing £21 10s. (4.36c. per lb.) f.o.b., May. The works are heavily sold.

We quote per gross ton, except where otherwise stated, f.o.b. makers' works, with American equivalent figured at \$4.54 per £1, as follows:

Durham coke, delivered	£1 19s.		\$8.85
Bilbao Rubio ore†.....	1 4		5.45
Cleveland No. 1 foundry	5 2½		23.27
Cleveland No. 3 foundry	4 16		21.79
Cleveland No. 4 foundry	4 11		20.66
Cleveland No. 4 forge..	4 8	to £4 9s.	19.98 to \$20.20
Cleveland basic .....	4 10	to 4 14	20.43 to 21.34
East Coast mixed.....	4 18½	to 5 0	22.36 to 22.70
Ferromanganese* .....	17 10		79.45
Rails, 60 lb. and up... ..	8 0	to 9 0	36.32 to 40.86
Billets .....	7 10	to 8 5	34.05 to 37.45
Sheet and tin plate bars, Welsh .....	9 2½		41.43
Tin plates, base box... ..	1 3½	to 1 3¼	5.25 to 5.28
Ship plates .....	9 0	to 9 10	1.82 to 1.93
Boiler plates .....	12 10	to 13 0	2.53 to 2.63
Tees .....	9 10	to 10 0	1.93 to 2.03
Channels .....	8 15	to 9 5	1.77 to 1.87
Beams .....	8 10	to 9 0	1.72 to 1.82
Round bars, ¾ to 3 in. 10	5	to 10 15	2.08 to 2.18
Galvanized sheets, 24 g. 19	0	to 19 5	3.85 to 3.90
Black sheets, 24 gage..	14 0		2.84
Black sheets, Japanese specifications .....	15 5		3.09
Steel hoops .....	12 0	& 12 10*	2.43 & 2.53*
Cold rolled steel strip, 20 gage .....	17 5		3.50
Cotton ties, Indian specifications .....	15 0		3.04

\*Export price. †Ex-ship, Tees, nominal.

## Continental Prices, All F. O. B. Channel Ports

Foundry pig iron:			
Belgium .....	£5 5s.	to £5 10s.	\$23.83 to \$24.97
France .....	5 5	to 5 10	23.83 to 24.97
Luxembourg .....	5 5	to 5 10	23.83 to 24.97
Billets (nominal):			
Belgium .....	7 0		31.78
France .....	7 0		31.78
Merchant bars:			C. per Lb.
Belgium .....	8 7½	to 9 0	1.70 to 1.82
Luxembourg .....	8 7½	to 9 0	1.70 to 1.82
France .....	7 10		1.52
Joists (beams):			
Belgium .....	8 2½		1.65
Luxembourg .....	8 2½		1.65
France .....	7 10	to 7 12½	1.52 to 1.55
Angles:			
Belgium .....	8 0	to 8 5	1.62 to 1.67
½-in. plates:			
Belgium .....	8 10		1.72
Germany .....	8 10		1.72
⅞-in. plates:			
Luxembourg .....	7 15		1.57
Belgium .....	8 0		1.62

## A Tin Plate Amalgamation and a Central Selling Agency—Export Trade Unsatisfactory

LONDON, ENGLAND, Oct. 4.—Conditions in the iron and steel markets are still far from bright, the prolonging of the boilermakers' dispute causing home consumers particularly to refrain from purchasing on any substantial scale. At one time it was hoped that an end could be brought to this disastrous lockout, but at the moment there is little light on the horizon. The shipyards in Scotland are, of course, suffering most severely, as there is practically nothing moving in new shipbuilding, but it is stated that there are orders to be placed, and that once the boilermakers get back to work the yards will be kept busy for some time to come.

Home railroads continue to place a certain amount of requirements, and here and there some structural orders are secured for shipment overseas, but apart from the very strong demand from Japan for galvanized and black sheets the export trade still remains in a very unsatisfactory state. Prices do not recede much, but on the fortnight are about 5s. easier, but even with this decrease some makers say that they are rolling without any margin of profit. Certainly the cost of production shows no sign of going down to anything



like an economic level, chiefly owing to the high price of fuel. At one time it seemed as though coke would be cheaper, but with the improvement in the franc rate continental demand for British fuel became strong again, and prices in consequence hardened. The production of pig iron has been cut down fairly considerably, but the demand for foundry grades is so poor that makers are continually granting concessions in an endeavor to clear out the stocks in their yards. The demand for hematite, however, has improved, and with the output of this grade of material still restricted, supplies are quickly absorbed and prices maintain a fairly steady level. No. 3 Cleveland G.M.B. is weak at about 96s., and East Coast mixed numbers are quoted in the neighborhood of 99s. and upward.

A little time ago a notice was issued that the Grovesend Steel & Tinplate Co. had absorbed the Duffryn, Mardy and Dynevor Tinplate Works, and had thereby become the second largest tinplate producer in South Wales. Now comes the indication that the Grovesend and Richard Thomas & Co., the latter company being the largest manufacturers of tinplates in the world, owning 14 tinplate works, comprising 111 mills with a capacity of over 4500 tons of tinplates a week, and of over 6500 tons of steel bars a week, have come to an agreement so that the total capacity of the amalgamation of the two companies will result in a steel production in South Wales alone of about 11,000 or 12,000 tons a week. Great efforts are being made in certain directions to establish a tinplate central selling agency, and it is evident that this amalgamation is in connection with this proposal. Whether the selling agency will eventually develop or not it is difficult to say, but certainly at the present time many of the tinplate makers are putting up a strong opposition.

### Wages in Industries Rise

WASHINGTON, Oct. 15.—Total earnings of 2,352,516 employees in 51 manufacturing industries in September during one week amounted to \$61,507,092 the Labor Department has announced. The same industries in August reported 2,352,945 employees with a total payroll of \$61,436,603. A combined total from the 51 industries showed 80 per cent reporting as working full time, 18 part time and 2 per cent closed.

The September payroll by Youngstown, Ohio, industries, principally iron and steel properties, aggregated \$6,803,933, the third highest month since January, 1921. Total expenditure for wages the first nine months in the year is \$57,331,828, a figure higher than the totals for the full years of 1921 or 1922. It is expected the payroll figures for the year will exceed \$75,000,000, a gain of 50 per cent over the previous year.

Clifford B. Connelley, director of industrial relations, Carnegie Institute of Technology, will have charge of the public relations section of the Pittsburgh Personnel Association this year. This section has planned a series of general meetings to be carried on this winter to bring to the attention of all of those interested in the industrial and commercial welfare of Pittsburgh the best modern practice in handling human relations.

Gross sales of the American Chain Co., Inc., for the eight months ended Aug. 31 reached \$20,945,648. Net earnings for the period amounted to more than two and one-half times the net earnings for all of 1922. The balance sheet as of July 31, last, showed quick assets of \$14,343,500 against quick liabilities of \$2,385,000.

A cablegram from London says the fusion of the Grovesend Steel Tin Plate Co. with Thomas & Co. is now complete, the latter company having paid £1,100,000 for control.

## BRITISH FOREIGN TRADE

### August Steel Exports Larger Than in July—Imports But Slightly Changed

August exports of British iron and steel showed an increase over July of about 15,900 tons. This is the first increase in several months. The August exports were 330,431 gross tons as compared with 314,522 tons in July. The imports in August of 121,906 tons were the smallest since May; these compare with 128,486 tons in July. Comparative data for both exports and imports, scrap being included, were as follows:

British Steel Exports and Imports, Gross Tons

	Exports	Imports
Aver. per month, first quarter, 1923...	358,208	128,032
April, 1923 .....	398,507	133,929
May, 1923 .....	435,630	114,132
June, 1923 .....	373,277	130,066
Aver. per month, second quarter, 1923...	402,471	126,042
July, 1923 .....	314,522	128,486
August, 1923 .....	330,431	121,906
Average per month, 1922 .....	295,980	82,215
Average per month, 1921 .....	144,885	152,734
Average per month, 1920 .....	274,881	128,685
Average per month, 1919 .....	188,519	50,801
Average per month, 1913 .....	423,757	195,264

More detailed data of the exports are as follows:

Principal British Exports, Gross Tons per Month

	1913	1922	August 1922	1923
Pig iron	93,700	66,159	30,643	55,107
Ferroalloys	42,200	21,300	15,607	15,247
Steel rails	11,200	6,700	22,358	16,874
Steel plates	63,500	43,600	6,273	15,434
Galvanized sheets	20,900	19,100	47,404	41,787
Steel bars, rods, etc.	41,200	37,400	17,533	27,930
Tin plates	11,700	18,700	36,817	41,798
Black plates and sheets			18,577	26,038

Data as to importations of importance are as follows in tons per month:

	1913	1922	Jan.-Aug., 1923
Iron ore	620,000	289,400	522,213
Manganese ore	50,100	28,109	42,652
Pig iron and ferroalloys	18,000	12,800	10,989

Exports of scrap iron and steel in August were 6554 tons, or 9975 tons per month for the first eight months of this year, as compared with 12,880 tons per month in 1922. In 1913 there were 9600 tons per month.

The Interstate Commerce Commission, on complaint of several steel manufacturers and consumers affected, has suspended until February the new tariff recently announced, reestablishing the 21½c. rate on steel between Pittsburgh and Cleveland and other Ohio points. Consequently the 19c. combination rate will remain in effect until further action is taken.

The members of the Electric Hoist Manufacturers' Association report a decrease of 2.7 per cent in the number of hoists sold during September as compared with the previous month, and a decrease of 6 per cent in the value of hoists ordered. Shipments for the month of September decreased 21.4 per cent as compared with the previous month.

The Ford Motor Co. is operating its valve manufacturing plant at Northville, Mich., at maximum capacity, giving employment to about 350 men under three 8-hr. shifts. Current production is at the rate of 2,500,000 valves per month, including those for Ford automobiles, trucks and tractors. About 10,000 tractor valves alone are being turned out daily.

The Baker R & L Co., Cleveland, manufacturer of Baker trucks and Raulang automobile bodies, reported in stockholders' meeting that orders in hand for both divisions will extend well into the spring months. Dividends were declared at 7 per cent for preferred and 6 per cent for common stock. President F. W. Treadway stated that surplus is now about \$500,000.

# Prices Finished Iron and Steel f.o.b. Pittsburgh

Carload Lots

Plates	
Sheared, tank quality, base, per lb.	2.50c.
Structural Materials	
Beams, channels, etc., base, per lb.	2.50c.
Sheet piling	2.65c.

Iron and Steel Bars	
Soft steel bars, base, per lb.	2.40c.
Soft steel bars for cold finishing	\$3 per ton over base
Reinforcing steel bars, base	2.40c.
Refined iron bars, base, per lb.	3.25c.
Double refined iron bars, base, per lb.	4.85c. to 5.00c.
Stay bolt iron bars, base, per lb.	8.00c. to 8.50c.

Hot-Rolled Flats	
Hoops, base, per lb.	3.15c.
Bands, base, per lb.	3c. to 3.15c.
Strips, base, per lb.	3c. to 3.15c.
Cotton ties, per bundle of 45 lb.	\$1.63

Cold-Finished Steels	
Bars and shafting, base, per lb.	3.25c.
Bars, S. A. E. Series, No. 2100	4.50c. to 4.75c.
Bars, S. A. E. Series, No. 2300	6.50c. to 6.75c.
Bars, S. A. E. Series, No. 3100	5.50c. to 5.75c.
Strips, base, per lb.	5.00c.

Wire Products	
Nails, base, per keg	\$3.00
Galvanized nails, 1 in. and over	\$2.25 over base
Galvanized nails, less than 1 in.	2.50 over base
Bright plain wire, base, No. 9 gage, per 100 lb.	2.75
Annealed fence wire, base, per 100 lb.	2.90
Spring wire, base, per 100 lb.	3.70
Galvanized wire, No. 9, base, per 100 lb.	3.35
Galvanized barbed, base, per 100 lb.	3.80
Galvanized staples, base, per keg	3.80
Painted barbed wire, base, per 100 lb.	3.45
Polished staples, base, per keg	3.45
Cement coated nails, base, per count keg	2.70
Woven fence, carloads (to jobbers)	67½ per cent off list
Woven fence, carloads (to retailers)	65 per cent off list

Bolts and Nuts	
Machine bolts, small, rolled threads	60, 10 and 10 per cent off list
Machine bolts, all sizes, cut threads	.60 and 10 per cent off list
Carriage bolts, ¾ x 6 in.	60 per cent off list
Smaller and shorter, rolled threads	.60 and 10 per cent off list
Carriage bolts, cut threads, all sizes	.60 per cent off list
Lag bolts	.65 and 10 per cent off list
Plow bolts, Nos. 1, 2 and 3 heads	.50 and 10 per cent off list
Other style heads	.50 per cent extra
Machine bolts, c.p.c. and t. nuts ¾ x 4 in.	50 and 10 per cent off list
Larger and longer sizes	50 and 10 per cent off list
Hot pressed square or hex. nuts, blank	4.25c. off list
Hot pressed nuts, tapped	4.25c. off list
C.p.c. and t. square or hex. nuts, blank	4.00c. off list
C.p.c. and t. square or hex. nuts, tapped	4.00c. off list
Semi-finished hex. nuts:	
¾ in. and smaller, U. S. S.	.80 to 80 and 5 per cent off list
¾ in. and larger, U. S. S.	.75 to 75 and 5 per cent off list
Small sizes S. A. E.	.80 and 10 to 80, 10 and 5 per cent off list
S. A. E., ¾ in. and larger	75 and 10 to 75, 10 and 5 per cent off list
Stove bolts in packages	.75, 10 and 5 per cent off list
Stove bolts in bulk	.75, 10, 5 and 2½ per cent off list
Tire bolts	.60 and 10 per cent off list
Bolt ends with hot pressed nuts	.60 and 5 per cent off list
Turnbuckles, with ends, ½ in. and smaller	55 and 5 to 50 per cent off list
Turnbuckles, without ends, ½ in. and smaller	70 and 10 to 65 and 5 per cent off list
Washers	5c. to 5.25c. off list

Cap and Set Screws	
Milled square and hex. head cap screws	.70 per cent off list
Milled set screws	.70 per cent off list
Upset cap screws	.75 and 10 per cent off list
Upset set screws	.75 and 10 per cent off list
Milled studs	.50 and 10 per cent off list

Rivets	
Large structural and ship rivets, base, per 100 lb.	\$2.75 to \$3.00
Small rivets	.65 and 10 to 70 off list

Track Equipment	
Spikes, ¾ in. and larger, base, per 100 lb.	\$3.15
Spikes, ½ in., ⅞ in. and ¾ in., per 100 lb.	\$3.15 to 3.50
Spikes, ⅞ in.	3.15 to 3.50
Spikes, boat and barge, base, per 100 lb.	3.50
Track bolts, ¾ in. and larger, base, per 100 lb.	\$4.00 to 4.25
Track bolts, ½ in. and ¾ in., base, per 100 lb.	5.00 to 5.50
Tie plates, per 100 lb.	2.55 to 2.60
Angle bars, base, per 100 lb.	2.75

Steel		Welded Pipe		Iron	
Inches	Black	Galv.	Inches	Black	Galv.
1/8	45	19½	1/4 to 3/8	+11	+39
1/4 to 3/8	51	25½	1/2	22	2
1/2	56	42½	3/4	28	11
3/4	60	48½	1 to 1½	30	13
1 to 3	62	50½			
Lap Weld					
2	55	43½	2	23	7
2½ to 6	59	47½	2½	26	11
7 and 8	56	43½	3 to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
Butt Weld, extra strong, plain ends					
1/8	41	24½	2 to 3	61	50½
1/4 to 3/8	47	30½	1/2 to 3/4	+19	+54
1/2	53	42½	1	21	7
3/4	58	47½	3/4	28	12
1 to 1½	60	49½	1 to 1½	30	14
Lap Weld, extra strong, plain ends					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

To the large jobbing trade the above discounts are increased by one point, with supplementary discounts of 5 per cent on black and 1½ points, with a supplementary discount of 5 per cent on galvanized.

Boiler Tubes		Charcoal Iron	
Lap Welded Steel			
2 to 2½ in.	27	1½ in.	+18
2½ to 2¾ in.	37	1¾ to 1½ in.	+8
3 in.	40	2 to 2¾ in.	+2
3¼ to 3½ in.	42½	2½ to 3 in.	-7
4 to 13 in.	46	3½ to 4½ in.	-9

Standard Commercial Seamless Boiler Tubes		Cold Drawn	
1 in.	55	3 and 3¼ in.	36
1¼ and 1½ in.	47	3½ and 3¾ in.	37
1¾ in.	31	4 in.	41
2 and 2½ in.	22	4½ in. and 5 in.	33
2½ and 2¾ in.	32		
Hot Rolled			
3 and 3¼ in.	38	4 in.	43
3½ in. and 3¾ in.	39		

Less carloads, 4 points less. Add \$8 per net ton for more than four gages heavier than standard. No extras for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be sold at mechanical tube list and discount. Intermediate sizes and gages not listed take price of net larger outside diameter and heavier gage.

Seamless Mechanical Tubing	
Carbon under 0.30, base	.83 per cent off list
Carbon 0.30 to 0.40, base	.81 per cent off list
Plus usual differentials and extras for cutting. Warehouse discounts range higher.	

Seamless Locomotive and Superheater Tubes	
Cents per Ft.	Cents per Ft.
2-in. O.D. 12 gage	15
2-in. O.D. 11 gage	16
2-in. O.D. 10 gage	17
2½ in. O.D. 12 gage	17
2½ in. O.D. 11 gage	18
2½ in. O.D. 10 gage	20
3-in. O.D. 7 gage	35
1½ in. O.D. 9 gage	15
5½ in. O.D. 9 gage	55
5½ in. O.D. 9 gage	57

Tin Plate	
Standard cokes, per base box	\$5.50

Terne Plate	
(Per Package, 20 x 28 in.)	
8-lb. coating, 100 lb.	base \$11.00
8-lb. coating I. C.	11.30
12-lb. coating I. C.	12.70
15-lb. coating I. C.	13.95
20-lb. coating I. C.	14.90
25-lb. coating I. C.	16.20
30-lb. coating I. C.	17.35
35-lb. coating I. C.	18.35
40-lb. coating I. C.	19.35

Sheets	
Blue Annealed	
Nos. 9 and 10 (base), per lb.	3.00c.
Box Annealed, One Pass Cold Rolled	
No. 28 (base), per lb.	3.75c. to 3.85c.
Automobile Sheets	
Regular auto body sheets, base (22 gage), per lb.	5.35c.
Galvanized	
No. 28 (base), per lb.	3.00c.
Long Ternes	
No. 28 gage (base), 8-lb. coating, per lb.	5.30c.
Tin-Mill Black Plate	
No. 28 (base), per lb.	3.85c.

## Freight Rates

All freight rates from Pittsburgh on finished iron and steel products, carload lots, per 100 lb.:

Philadelphia, domestic	\$0.32	Buffalo	\$0.265	St. Louis	\$0.43	Pacific Coast	\$1.15
Philadelphia, export	\$0.235	Cleveland	0.215	Kansas City	0.735	Pac. Coast, ship plates	1.34
Baltimore, domestic	0.31	Cleveland, Youngstown		Kansas City (pipe)	0.705	Birmingham	0.58
Baltimore, export	0.225	Comb.	0.19	St. Paul	0.60	Memphis	0.56
New York, domestic	0.34	Detroit	0.29	Omaha	0.735	Jacksonville, all rail	0.70
New York, export	0.255	Cincinnati	0.29	Omaha (pipe)	0.705	Jacksonville, rail and water	0.415
Boston, domestic	0.365	Indianapolis	0.31	Denver	1.27	New Orleans	0.67
Boston, export	0.255	Chicago	0.34	Denver (pipe)	1.215		

The minimum carload to most of the foregoing points is 6000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Rates from Atlantic Coast ports (i.e., New York, Philadelphia and Baltimore) to Pacific Coast ports of call on most steamship lines, via the Panama Canal, are as follows: Pig iron, 35c.; ship plates, 40c.; ingot and muck bars, structural steel, common wire products including cut or wire nails, spikes, and wire hoops, 40c.; sheets and tin plates, 40c.; sheets, No. 12 gage and lighter, 50c.; rods, 40c.; wire rope cables and strands, 45c.; wire fencing, netting and stretcher, 40c.; pipe, not over 12 in. in diameter, 55c.; over 12 in. in diameter, 2½c. per in. or fraction thereof additional. All prices per 100 lb. in carload lots, minimum 40,000 lb.



# Prices of Raw Materials, Semi-Finished and Finished Products

## Ores

Lake Superior Ores, Delivered Lower Lake Ports	
Old range Bessemer, 55 per cent iron.....	\$6.45
Old range non-Bessemer, 51½ per cent iron.....	5.70
Mesabi Bessemer, 55 per cent iron.....	6.20
Mesabi non-Bessemer, 51½ per cent iron.....	5.55

### Foreign Ore, per Unit, c.i.f. Philadelphia or Baltimore

Iron ore, low phos., copper free, 55 to 58 per cent iron in dry Spanish or Algerian..	10.50c.
Iron ore, Swedish, average 66 per cent iron	10.50c.
Manganese ore, washed, 51 per cent manganese, from the Caucasus, nominal.....	42c.
Manganese ore, ordinary, 48 per cent manganese, from the Caucasus.....	39c.
Manganese ore, Brazilian or Indian, nominal	42c.
Tungsten ore, per unit, in 60 per cent concentrates .....	\$8.25 to \$10.00
Chrome ore, basic, 48 per cent Cr <sub>2</sub> O <sub>3</sub> , crude, per ton, c.i.f. Atlantic seaboard.....	18.00 to 28.00
Molybdenum ore, 85 per cent concentrates, per lb. of MoS <sub>3</sub> , New York.....	75c. to 85c.

## Ferroalloys

Ferromanganese, domestic, 80 per cent, furnace, or seaboard, per ton.....	\$110.00
Ferromanganese, British, 80 per cent, f.o.b. Atlantic port, duty paid.....	110.00
Spiegeleisen, domestic, 19 to 21 per cent, per ton, furnace .....	\$42.00 to 45.00
Spiegeleisen, domestic, 16 to 19 per cent, furnace, per ton.....	41.00 to 44.00
Ferrosilicon, 50 per cent, delivered, per gross ton .....	80.00 to 87.00
Ferrosilicon, Bessemer, 10 per cent, per ton, furnace .....	43.50
Ferrosilicon, Bessemer, 11 per cent, per ton, furnace .....	46.80
Ferrosilicon, Bessemer, 12 per cent, per ton, furnace .....	50.10
Ferrosilicon, Bessemer, 13 per cent, per ton, furnace .....	54.10
Ferrosilicon, Bessemer, 14 per cent, per ton, furnace .....	59.10
Silvery iron, 6 per cent, per ton, furnace..	32.00
Silvery iron, 7 per cent, per ton, furnace..	33.00
Silvery iron, 8 per cent, per ton, furnace..	34.50
Silvery iron, 9 per cent, per ton, furnace..	36.50
Silvery iron, 10 per cent, per ton, furnace..	38.50
Silvery iron, 11 per cent, per ton, furnace..	41.80
Silvery iron, 12 per cent, per ton, furnace..	45.10
Ferrotungsten, per lb. contained metal.....	88c. to 90c.
Ferrochromium, 4 to 6 per cent carbon, 60 to 70 per cent Cr. per lb. contained Cr. delivered .....	12c.
Ferrochromium, 6 to 7 per cent carbon, 60 to 70 per cent Cr., per lb.....	11.50c.
Ferrovanadium, per lb. contained vanadium	\$3.50 to \$4.00
Ferrocobaltititanium, 15 to 18 per cent, per net ton .....	200.00

## Fluxes and Refractories

Fluorspar, 80 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines .....		\$22.00
Fluorspar, 85 per cent and over calcium fluoride, not over 5 per cent silica, per net ton f.o.b. Illinois and Kentucky mines .....		23.50
Per 1000 f.o.b. works:		
Fire Clay:		
Pennsylvania .....	High Duty \$42.00 to \$45.00	Moderate Duty \$37.00 to \$42.00
Maryland .....	47.00	42.00
Ohio .....	42.00 to 43.00	37.00 to 39.00
Kentucky .....	42.00 to 43.00	37.00 to 39.00
Illinois .....		37.00 to 42.00
Missouri .....	42.00 to 45.00	35.00 to 40.00
Ground fire clay, per net ton.....		6.00 to 7.00
Silica Brick:		
Pennsylvania .....		42.00
Chicago .....		45.00
Birmingham .....		50.00
Ground silica clay, per net ton.....		5.00
Magnesite Brick:		
Standard size, per net ton (f.o.b. Baltimore and Chester, Pa.) .....		65.00
Grain magnesite, per net ton (f.o.b. Baltimore and Chester, Pa.).....		40.00
Chrome Brick:		
Standard size, per net ton.....		50.00

## Semi-Finished Steel, f.o.b. Pittsburgh or Youngstown, per gross ton

Rolling billets, 4-in. and over.....	\$40.00 to \$42.50
Rolling billets, 2-in. and under.....	40.00 to 42.50
Forging billets, ordinary carbons.....	47.50
Sheet bars, Bessemer.....	42.50
Sheet bars, open-hearth.....	42.50

Slab .....	\$40.00 to \$42.50
Wire rods, common soft, base, No. 5 to ¼-in.	51.00
Wire rods, common soft, coarser than ¼-in.	\$2.50 over base
Wire rods, screw stock.....	\$5 per ton over base
Wire rods, carbon 0.20 to 0.40.....	3 per ton over base
Wire rods, carbon 0.41 to 0.55.....	5 per ton over base
Wire rods, carbon 0.56 to 0.75.....	7.50 per ton over base
Wire rods, carbon over 0.75.....	10 per ton over base
Wire rods, acid .....	15 per ton over base
Skelp, grooved, per lb.....	2.40
Skelp, sheared, per lb.....	2.40
Skelp, universal, per lb.....	2.40

## Finished Iron and Steel, f.o.b. Mill

Rails, heavy, per gross ton.....	\$43.00
Rails, light, new steel, base, per lb.....	2.15c. to 2.25c.
Rails, light, rerolled base, per lb.....	1.90c. to 2.00c.
Spikes, ½-in. and larger, base, per 100 lb....	\$3.15
Spikes, ½-in., ⅝-in. and ¾-in., base per 100 lb.	\$3.15 to 3.50
Spikes, ¾-in., base, per 100 lb.....	3.15 to 3.50
Spikes, boat and barge, base, per 100 lb.....	3.50
Track bolts, ½-in. and smaller, base, per 100 lb.	4.15 to 4.25
Track bolts, ¾-in. and larger, base, per 100 lb.	4.75 to 5.50
Tie plates, per 100 lb.....	2.55 to 3.60
Angle bars, per 100 lb.....	2.75
Bars, common iron, base, per lb., Chicago mill.	2.40c.
Bars, common iron, Pittsburgh mill.....	2.40c.
Bars, rails, steel reinforcing, base, per lb....	2.15c. to 2.25c.
Ground shafting, base, per lb.....	3.55c.
Cut nails, base, per keg.....	\$3.15 to \$3.25

## S. A. E. Semi-finished Castellated Nuts and U. S. S. Semi-finished Slotted Nuts

(To jobbers and consumers in large quantities f.o.b. Pittsburgh.)

	Per 1000	
	S. A. E.	U. S. S.
¼-in. ....	\$ 4.80	\$ 4.80
⅝-in. ....	5.50	6.00
¾-in. ....	6.50	7.00
⅞-in. ....	9.00	9.50
1-in. ....	11.00	11.50
1 ⅛-in. ....	15.00	15.00
1 ¼-in. ....	19.50	20.00
1 ½-in. ....	28.50	28.50
1 ¾-in. ....	37.00	37.50
2-in. ....	58.50	60.50
2 ¼-in. ....	88.00	97.00
2 ½-in. ....	132.00	132.00
2 ¾-in. ....	176.00	176.00
3-in. ....	220.00	220.00

Larger sizes—Prices on application

## Alloy Steel

S.A.E. Series Numbers	Bars 100 lb.
2100* (½% Nickel, 10 to 20 per cent Carbon)...	\$3.25 to \$3.50
2300 (3½% Nickel) .....	5.25 to 5.50
2500 (5% Nickel) .....	7.75 to 8.00
3100 (Nickel Chromium) .....	4.25 to 4.50
3200 (Nickel Chromium) .....	6.00 to 6.25
3300 (Nickel Chromium) .....	8.00 to 8.25
3400 (Nickel Chromium) .....	7.00 to 7.25
5100 (Chromium Steel) .....	3.75 to 4.00
5200* (Chromium Steel) .....	8.00 to 8.25
6100 (Chromium Vanadium bars).....	5.00 to 5.25
6100 (Chromium Vanadium spring steel).....	4.75 to 5.00
9250 (Silico Manganese spring steel).....	3.75 to 4.00
Nickel Chrome Vanadium (0.60 Nickel, 0.50 Chromium, 0.15 Vanadium) .....	5.25 to 5.50
Chromium Molybdenum bars (0.80—1.10 Chromium, 0.25—0.40 Molybdenum).....	4.50 to 4.75
Chromium Molybdenum bars (0.50—0.70 Chromium, 0.15—0.25 Molybdenum).....	4.25 to 4.50
Chromium Molybdenum spring steel (1—1.25 Chromium, 0.30—0.50 Molybdenum).....	4.25 to 4.50

Above prices are for hot-rolled alloy steel bars, forging quality, per 100 lb. f.o.b. Pittsburgh. Billets 4 x 4 in. and larger are \$10 per gross ton less than net ton price for bars of same analyses. On smaller than 4 x 4-in. billets down to and including 2½-in. sq. there is a size extra of \$10 per gross ton; on billets smaller than 2½-in. sq., the net ton bar price applies.

\*Not S.A.E. specifications, but numbered by manufacturers to conform to S.A.E. system.

## FABRICATED STEEL BUSINESS

### Week's Awards Show Drop, But Large Tonnage Under Active Consideration

Contracts of fabricated steel work coming to light in the past week show a drop to 10,000 tons, but fresh inquiries involving 25,000 tons appeared and much encouragement was taken in five or six projects now actively considered in the New York metropolitan district and estimated to require 50,000 tons. These are mentioned in the New York market report covering finished iron and steel. Awards of the week include the following:

#### Structural Projects Awarded

Siegal apartment building, Amsterdam Avenue and Seventy-third Street, New York, 1000 tons, to Hay Foundry & Iron Works.

Highway bridge at Pequannock, N. J., 125 tons, to Phoenix Bridge Co.

Norfolk & Western Railroad, bridges, 400 tons, to a Virginia fabricator.

Highway bridge in West Virginia, 125 tons, to Roanoke Bridge Works.

Philadelphia & Reading Railroad, bridges, 250 tons, to Belmont Iron Works.

American Gas & Electric Co., power plant in Indiana, 2200 tons, to American Bridge Co.

Wilson Foundry Co., Pontiac, Mich., foundry, 520 tons, divided between Whitehead & Kales and Continental Bridge Co.

Vicksburg, Shreveport & Pacific Railroad, four track crossing over Marshall Street, Shreveport, La., 312 tons, to Mt. Vernon Bridge Co.

J. B. Murphy Memorial, Chicago, 308 tons, to Morava Construction Co.

High school building, Mishawaka, Ind., 263 tons to Elkhart Bridge & Iron Co.

Accomac Realty Co., St. Louis, lumber shelter, 180 tons, to Wood Construction Co.

Village of Hibbing, Minn., water tank and tower, 136 tons, to Minneapolis Steel & Machinery Co.

Tomahawk Kraft Paper Co., Tomahawk, Wis., digester building for paper mill, 108 tons, to Wausau Iron Works.

A. O. Smith Corporation, Milwaukee, framing and miscellaneous work, 200 tons, to Lakeside Bridge & Steel Co.

Commercial and apartment building for Stotzer Granite Co., Milwaukee, 100 tons, to Lakeside Bridge & Steel Co.

Lakeside Power Co., St. Francis, Milwaukee County, steel for superheaters, 200 tons, to Lakeside Bridge & Steel Co.

Quinze Power Co., Kippawa, Canada, Viele, Blackwell & Buck, 49 Broadway, New York, engineers, 210 tons, to the Hamilton Bridge Works Co., Hamilton, Ont., and 100 tons to Hepburn & Disher, Ltd., Toronto, Ont.

Maternity and Babies' Hospital, Cleveland, 1950 tons, to Forest City Steel & Iron Co., which has placed the steel with the Bethlehem Steel Co.

Erie County Home, Buffalo, N. Y., 800 tons, to Buffalo Structural Steel Co.

Kelleys Island Lime & Transport Co. viaduct at Kelleys Island, Ohio, 150 tons, to American Bridge Co.

#### Structural Projects Pending

Inquiries for fabricated steel work include the following:

Horn & Hardart Co., extension to bakery at 690 West Fiftieth Street, New York, 500 tons.

Steinway & Sons, piano warehouse and salesrooms, Fifty-seventh Street, New York, 1500 to 2000 tons.

Public school No. 210, Bronx, New York, 1100 tons.

Public school No. 205, Brooklyn, New York, 1100 tons.

Lapidus apartment building, New York, 800 to 1000 tons. Greenbaum loft building, 256 West Thirty-eighth Street, New York, 1000 tons.

Culver apartment building, New York, 300 tons.

Perth Amboy, N. J., bridge over Raritan River, 6000 tons, being readvertised, former bids having been rejected.

Parental school, Queens, New York, 250 tons.

Power plant, Stone & Webster, Boston, general contractors, 500 tons.

City of Philadelphia, tunnel, 500 tons.

Standard Oil Co. of New Jersey, structural work, 150 tons.

Standard Oil Co. of Indiana, structural work for erection at Cleveland, 150 tons.

Natanson loft buildings, New York, 9000 tons in two structures.

East Lake Street substation, Commonwealth Edison Co., Chicago, 1000 tons.

Mercy High School Building, Chicago, 650 tons.

St. Paul Bridge & Terminal Railway Co., bridge over Mississippi River, St. Paul, Minn., 600 tons.

Missouri Pacific Railroad, 11 plate girder spans, 350 tons, bids taken.

Pennsylvania Railroad, Southwestern Region, 92-ft. girder span, 110 tons, bids taken.

Knights of Columbus club house, Springfield, Ill., 300 tons, bids taken.

Louisville & Nashville Railroad, bridge work, 1600 tons, bids closed Oct. 23.

Big Four Railroad, bridge work, 800 tons, bids closed Oct. 23.

High schools, at Piqua, Ohio, 200 tons, bids being taken.

Hotel, Portsmouth, Ohio, 300 tons, bids being taken.

City of Cleveland, administration and other buildings for Baldwin reservoir, 600 tons; bids to be taken Oct. 24.

Bourne-Fuller Co., Cleveland, addition to steel warehouse, 600 tons.

Harding junior high school, Lakewood, Ohio, 100 tons.

## RAILROAD EQUIPMENT BUYING

### Fresh Spurt in Locomotive Inquiry, but Little Buying of Cars or Engines

In addition to the inquiry of the Southern Pacific for 58 locomotives, mentioned last week, the Louisville & Nashville has asked for prices on 39 and the Missouri Pacific on 80. The Pennsylvania and the Baltimore & Ohio are also figuring on the purchase of a considerable number of engines, according to reports in the railroad equipment trade. There seems to be some doubt, however, as to whether this business will be placed this year. In the case of the Southern Pacific it is stated that its inquiry has already been cut in half.

The locomotive equipment of the railroads of the country is now in the best condition it has been in years, according to reports of the car service division of the American Railway Association. On Oct. 1 15.3 per cent of the total number were in need of repair, the smallest number in need of repair for any period for which there are records.

The Department of Commerce has announced Sep-

tember shipments of railroad locomotives from the principal manufacturing plants. Unfilled orders at end of September were: Domestic, 1102 and foreign 76, against 1406 and 91 a month ago.

The Interborough Rapid Transit Co., New York, has come into the market for 100 to 250 all-steel subway cars.

The Philadelphia & Reading Railroad had ordered 50 passenger cars from the Harlan & Hollinsworth plant of the Bethlehem Shipbuilding Corporation.

The St. Louis Southwestern is inquiring for 150 steel underframes for stock cars.

The Nickel Plate has ordered 10 underframes for caboose cars from the Pennsylvania Tank Car Co.

Swift & Co. are inquiring for 100 refrigerator cars.

The Minneapolis & St. Louis has placed 100 box car repairs with the General American Car Co.

The Louisville Henderson & St. Louis is inquiring for 2 coaches, 2 coaches with middle smoker compartment and 3 combination baggage and mail cars.

The Chicago, Milwaukee & St. Paul contemplates placing repairs on 30,000 freight cars. The trucks of old equipment will be salvaged and new underframes and superstructures will be built.



## NON-FERROUS METALS

### The Week's Prices

Cents per Pound for Early Delivery							
Copper, New York		Straits Tin		Lead		Zinc	
Lake	Electro-lytic*	New York	New York	St. Louis	New York	St. Louis	
Oct. 10.....	13.25	12.75	41.62½	6.85	6.65	6.62½	6.27½
11.....	13.25	12.62½	41.37½	6.85	6.65	6.62½	6.27½
12.....	13.12½	12.50	.....	6.85	6.60	6.60	6.25
13.....	13.00	12.50	41.62½	6.85	6.60	6.62½	6.27½
14.....	13.00	12.50	41.62½	6.85	6.60	6.62½	6.27½
15.....	13.12½	12.62½	41.50	6.85	6.60	6.65	6.30

\*Refinery quotation; delivered price ¼c. higher.

### New York

NEW YORK, Oct. 16.

Some of the markets are more active than a week ago. Copper, after selling lower, is again higher. The tin market has been very dull. There has been very little change in the lead situation, but there has been a slight improvement in the zinc market. Friday, Oct. 12, was generally observed as a holiday.

**Copper.**—The electrolytic copper market, after falling to still lower levels during the week, has turned more active with the price tendency higher. In the last few days there has been fairly heavy buying by foreign consumers and a much more active inquiry from domestic melters. An interesting feature is the tendency of some consumers to inquire for delivery even into next year. In the past week sales have been made as low as 12.75c., delivered, although not all producers would meet this price. Today the market is a little higher at 12.87½c. to 13c., delivered, with some producers unwilling to do business at less than 13c. The market has every appearance of at least a brief rally.

**Tin.**—An unusually quiet week has prevailed in the market for Straits tin. The largest business was done last Thursday, Oct. 11, when about 200 tons changed hands. About half of this was futures or October-November shipment, which sold at 40.62½c. to 40.87½c. On one day two dealers attempted to sell futures but did not succeed. The holiday on Friday was also a factor in the prevailing dullness. Both yesterday and today the market has also been dull with a little business done yesterday in October delivery at 41.50c. An interesting announcement is that the New York Metal Exchange has inaugurated the practice of two calls a day instead of one, namely at 10.30 a. m. and 2.30 p. m. Spot Straits tin was quoted today at 41.50c., New York. Prices in the London market today were about £5 per ton lower than a week ago, with spot standard quoted at £201 15s., future standard at £199 17s. 6d. and spot Straits at £202 15s. The arrivals thus far this month have been 2265 tons, with 8414 tons reported afloat.

**Lead.**—The market continues very quiet with prices practically unchanged. Demand is good but not sufficiently in excess of production to create any premiums. The leading interest continues to maintain its quotation at 6.85c., New York. In the outside market quotations are 6.85c., New York, and 6.60c., St. Louis.

**Zinc.**—Due partly to an advance of about £1 per ton in the British market and also to a slightly improved domestic inquiry prices of prime Western have stiffened in the past few days until today quotations range from 6.27½c. to 6.32½c., St. Louis, or 6.62½c. to 6.67½c., New York. Bids of 6.30c., St. Louis, are reported rejected. There is also some prospect of further sales to England.

**Nickel.**—Shot and ingot nickel continues to be quoted at 29c., the price of the leading producers, while electrolytic nickel is held at 32c. In the outside market there are some quotations of 28c. per lb. on shot and ingot nickel.

**Antimony.**—Wholesale lots of Chinese metal for early delivery are quoted at 7.45c. to 7.55c., New York, duty paid.

**Aluminum.**—Virgin metal, 98 to 99 per cent pure, is quoted by importers at 25c. to 26c. per lb., New York,

duty paid, with some sellers unable to obtain the metal from their principals.

**Old Metals.**—Business is very dull and values are off again. Dealers' selling prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible.....	12.75
Copper, heavy and wire.....	11.50
Copper, light and bottoms.....	10.25
Heavy machine composition.....	10.00
Brass, heavy.....	7.25
Brass, light.....	6.00
No. 1 red brass or composition turnings..	8.50
No. 1 yellow red brass turnings.....	6.50
Lead, heavy.....	6.50
Lead, tea.....	5.50
Zinc.....	5.00
Cast aluminum.....	16.25
Sheet aluminum.....	16.25

### Chicago

Oct. 16.—Copper, lead and spelter are lower, while tin has advanced. Scattered reductions have been made in the old metals. Business is still very quiet. We quote in carload lots: Lake copper, 13.75c.; tin, 42c.; lead, 6.65c.; spelter, 6.25c.; antimony, 9c.; in less than carload lots. On old metals we quote copper wire, crucible shapes and copper clips, 10.50c.; copper bottoms, 9c.; red brass, 8.25c.; yellow brass, 6c.; lead pipe, 5.25c.; zinc, 4c.; pewter, No. 1, 22c.; tin foil, 30c.; block tin, 35c.; all buying prices for less than carload lots.

### September Sheet Sales Showed Substantial Increase

PITTSBURGH, Oct. 15.—Sheet steel manufacturers reporting to the National Association of Sheet and Tin Plate Manufacturers in September made sales aggregating 223,556 tons, a gain as compared with August of about 107,000 tons. Sales for the first time since last March were in excess of shipments. Production in September was 49,000 tons less than in August and there was a decline of 29,000 tons in September shipments compared with those of the month before. Unfilled tonnage at the end of the month was approximately 27,000 tons greater than at the end of August.

September figures in net tons compare with those of August and July as follows:

Per Cent Reporting.	Sept. 68.8	August 69.5	July 69.6
Sales.....	223,556	116,659	92,358
Production.....	185,577	234,112	174,910
Shipments.....	205,772	234,486	192,261
Unfilled tonnage....	343,096	316,972	404,868
Unshipped tonnage..	84,338	102,354	109,088
Unsold stock.....	29,975	32,252	32,062

### Record Car Loading

More cars were loaded with revenue freight in the week ended Sept. 29 than in any other week in railroad history. The total was 1,097,274 cars. This exceeded by 4707 cars the previous record which was established for the week of Sept. 1, this year, when the total was 1,092,567 cars.

Detailed instructions for the proper installation, operation and care of electric motors and generators are given in a booklet which has been published by the motor and generator section of the Electric Power Club. The instructions are grouped under the five headings: General installation, method of drive, operation, care and maintenance. Standard definitions referring to motors and generators are also given in this booklet, copies of which undoubtedly may be obtained by applying to the Electric Power Club, 900 Keith Building, Cleveland.

Warehousing and transportation economies in distribution are discussed in a leaflet prepared for general circulation by the Domestic Distribution Department of the Chamber of Commerce of the United States, Alvin E. Dodd, Mills Building, Washington, manager.

## TRADE WITH MEXICO

### Resumption Will Be Gradual—Some Lowering of Iron and Steel Duties

BY CHARLES L. SMITH

EL PASO, TEXAS, Oct. 15.—Recognition of Mexico by the United States has improved conditions in that country to a considerable extent, but there has not been time enough for the opening up of channels through which foreign capital travels. The improvement has been mainly in collections. El Paso exporters of hardware and machinery supplies have been especially successful in collecting accounts, some of which were long past due. The general opinion is that a feeling of confidence on the part of the Mexicans themselves has brought into circulation considerable money that has been hoarded for some time past. To a certain extent this confidence is shared by a number of foreign mining companies whose properties have either been idle or operating with greatly reduced forces for a number of years. These companies are quietly making plans for reopening their mines, but it is too early to expect machinery orders from them.

The principal drawback with the mining companies, as well as with manufacturing concerns in Mexico, is the labor question. In many sections of Mexico radical labor has been in control, and while there are evidences that labor leaders are losing their grip to some extent, there are yet many vexing experiences in different localities that seem to be holding back investors.

On the other hand, companies such as the American Smelting & Refining Co., made up plans for expansion nearly a year ago and are going ahead with developments. The company is making extensive additions to its smelting plants at Chihuahua City and Asarco, and early in August ground was broken at San Luis Potosi for a new smelter that will have a larger capacity than that at Chihuahua City. Most of the machinery has been bought, but some shop equipment is yet to be provided.

The National Railways of Mexico are understood to have requisitions in hand for shop equipment, many

of which are dated as far back as 1921. On account of the delay in determining whether the National Lines will be turned back to the original stockholders or continued under Government operation, it is not likely that these machine tools and other equipment will be purchased for some time yet. The Mexico Northwestern Railway, an independent system operating some 500 miles of track in northern Mexico, is also short of shop equipment, but no plans have been formulated for buying to fill its needs. It is somewhat surprising to note the excellent condition of the rolling stock of this railroad that has been operating under a handicap for more than ten years. This statement also applies to the passenger equipment of the National Railways of Mexico. Naturally, later a good many machine tools will be shipped to Mexico, but business just now is limited to a few single tools for replacement purposes.

Dealers in electrical equipment have more business in sight just now than anyone else in the machinery line. In different parts of Mexico some large hydro-electric plants are under way, or already have been completed. Among the latest of those now operating is a large generating plant at La Boquilla dam, about 90 miles from Chihuahua City and about equally distant from the Cusiuhiriachic mining district in the State of Chihuahua. Transmission lines are now under construction to both Chihuahua City and the mining district, and the project has been productive of a number of inquiries for electric motors and electrical fixtures.

Recent changes in Mexican import duties lower the schedule on a few items of iron and steel. Quoted in Mexican money, which for practical purposes may be figured at 50 per cent discount, they are as follows: Plain bars, 7 centavos per kilo; reinforcing bars, 8 centavos per kilo; structural steel, \$6.50 per 100 kilos; barb wire \$1 per 100 kilos; plain wire \$3.50 per 100 kilos; woven wire fence \$3.50 per 100 kilos; poultry netting, 18 centavos per kilo. Mining machinery is admitted free of duty.

Developments on the west coast of Mexico include an extension of the Southern Pacific Railroad of Mexico, work on which is now under way.

### Progressive Policies of W. M. Horner, President Mahr Mfg. Co., Minneapolis

In taking over the general management of the Mahr Mfg. Co., Minneapolis, Sept. 1, 1923, W. M. Horner, president, has promulgated a new policy in having sales engineers in the field deal directly with the engineering department, leaving matters of small detail only to the sales department. This, he believes, secures better service to the field engineers, which in turn is passed on to the customer. Mr. Horner, in other words, believes in direct dealing.



W. M. HORNER

Since investing in the company in 1917, and on taking an active interest in its affairs, he made, as one of his first recommendations, the creation of an engineering department. Because of the technical nature of oil burning equipment sales engineers were established at every important business center.

In addition to the business practices mentioned Mr. Horner has put into effect original methods of dealing with employees. In January, 1921, he promulgated a profit sharing plan so that all members of the company would share in the profits of the business. He has put in operation a plan for paying wages to shop men during sick leave, group life insurance, free clinical

examinations for employees who appear ailing, and has also done away with clock punching at the noon hour, and high shop wages are paid, notwithstanding the benefits enumerated.

Liberal treatment of employees has not adversely affected output, as is sometimes said to be the experience. Improved output per man in the shop and the general zeal of all members of the company in their work is the report.

### American Iron and Steel Institute—The Henry M. Howe Memorial

The memorial services for Dr. Henry Marion Howe, to be held in the Cathedral of St. John the Divine, New York, on Thursday afternoon, Oct. 25, at five o'clock, were arranged some time ago by correspondence between Bishop Manning of the Episcopal Diocese of New York and Judge Gary, president of the American Iron and Steel Institute. Dr. Howe was an honorary member of the institute and President Gary hopes there will be a general attendance of members who on that day attend the sessions of the American Iron and Steel Institute. The principal address will be by Dr. Michael Pupin of Columbia University.

A goodly number of reservations are being received for the banquet of the institute to be held Thursday night, Oct. 25. There will be ample time after the adjournment of the afternoon session for members to attend the services at the cathedral and return to the Hotel Commodore for the banquet.

The trip to the Aberdeen Proving Ground will occupy the following day, the train starting from New York Thursday night after the banquet and returning Friday night, arriving in New York at 11:30.



## PERSONAL

Thomas F. Du Puy, who has been variously connected in the steel trade, is now representative in the Eastern territory for the Electro Alloys Co., Elyria, Ohio, with office at Room 1959, 50 Church Street, New York.

Frank R. Frost, who has been in charge of Western sales for the Superior Steel Corporation, Pittsburgh, has been named general manager of sales upon the withdrawal from that company of Harry F. Devens, formerly Eastern sales manager, to become vice-president of the Morris & Bailey Steel Co. division of the Oliver Iron & Steel Corporation. Mr. Devens succeeds G. B. Morris and will have charge of cold-rolled strip steel sales, the product of the Morris & Bailey division.

R. T. Cadwell, formerly secretary-treasurer, Holcroft & Co., 6545 Epworth Boulevard, Detroit, has been appointed vice-president, and H. L. Ritts, previously sales manager of the company, succeeds him as secretary-treasurer.

Samuel Mather, Pickands Mather & Co., Cleveland, has made a gift of \$1,000,000 to Lakeside Hospital, Cleveland. This donation will be used for the building of a nurses' home in connection with the new hospital and is one of several gifts that have been made by Mr. Mather to this institution.

C. K. Leith, professor of geology, University of Wisconsin, Madison, addressed the Engineers' Society of Milwaukee on Oct. 17, on "The International Iron and Steel Situation in Its Bearing on the Ruhr."

George M. Gray, Peter Gray & Sons, Cambridge, Mass., who is touring England, France and Germany, is expected home about Nov. 1.

E. C. Herman has announced his withdrawal from the Barrett Co. and associated interests, New York.

Dr. W. L. McDougald, chairman of the Montreal Harbor Commission, Montreal, has confirmed reports of his resignation from the directorate of the British Empire Steel Corporation.

Raymond Sendell, sales manager the Groner Co., Inc., Phillipsburg, N. J., has resigned to join the sales force of the Treadwell Engineering Co., Easton, Pa.

Robert A. McDonald has resigned as general superintendent of the Crucible Steel Co. of America, and has severed his connections with that company. Mr. McDonald will take a well earned vacation before resuming active business. He has been identified with the steel industry in Pittsburgh for more than 30 years; during much of that time as a plant executive. He was superintendent of the plant of Miller, Metcalf & Parkin, which is now the Crescent works of the Crucible Steel Co. of America, and of which Mr. McDonald remained as manager after it was merged into that company. He also has been manager of the Park works of the company and also of the Pittsburgh Crucible Steel Co., a subsidiary of the Crucible Steel Co. of America. For the past two years he has been general superintendent of the company.

George R. Norton, formerly director of sales Withrow Steel Co., Pittsburgh, has become affiliated with the investment banking firm of Clapp, Dulaney & Co., 433 Union Trust Building, Pittsburgh.

E. C. Peck, works manager of the Cleveland Twist Drill Co., will address the Cleveland Engineering Society, Oct. 24 on "Standardization in its Relation to Management."

N. S. Bates, who has been connected with the Pratt & Whitney Co., Hartford, Conn., since 1902, where he more recently held the position of superintendent of equipment, has become connected with the Hartford Special Machinery Co., Hartford, Conn., as factory manager.

Walter V. Houck has been appointed sales engineer for Crane-Schiefer-Owens, Inc., and will be located in the home office at Buffalo. He was formerly chief engineer and production manager of the King Sewing

Machine Co., works manager of the Sterling Engine Co. and general manager of the Buffalo Metal Goods Co., when it was acquired by the General Motors Corporation.

Henry R. Lewis, who for several years was connected with the Standard Parts Co., Cleveland, as supervisor of orders, has joined the sales department of the American Welding & Mfg. Co., with headquarters at the main office in Warren, Ohio.

Richard W. Yerkes, formerly general manager of the Philadelphia plant, Link-Belt Co., has been appointed treasurer, succeeding B. A. Gayman, whom President Charles Piez of the Link-Belt Co. selected to head the newly acquired Meese & Gottfried Co., San Francisco, which will operate under the name Link-Belt, Meese & Gottfried Co. Mr. Yerkes will be located at the company's general offices, 910 South Michigan Avenue, Chicago.

L. Wechsler has taken supervision of the New York office of the Canton Foundry & Machine Co., Canton, Ohio, manufacturer of alligator shears, portable cranes, turntables, etc. Mr. Bergere, who was formally at the New York office, is now in charge of the New England division at 261 Broadway, New York.

Richard B. Sheridan, formerly in charge of the metallurgical laboratories of J. H. Williams & Co., Brooklyn works, has joined the metallurgical staff of the same company at the Buffalo works.

David Baker, who recently resigned as general manager of the steel works of the Broken Hill Proprietary Co., Ltd., Newcastle, Australia, will have as his address while in the United States the office of James B. Ladd, 1011 Chestnut Street, Philadelphia.

Harry S. Sternberg has been appointed sales manager of the Blakely Mfg. Co., Detroit, with general charge of distribution. He was for four years with the Signal Motor Truck Co. and is now vice-president and member of the board of directors. During the war he was with the Bethlehem Steel Co. at Bethlehem, Pa., intrusted with the development of its sources of supplying ordnance materials with the title of supervisor of ordnance subcontracts. Charles A. Goodspeed, factory manager, will continue in charge of manufacturing and W. W. Blakely will devote his time to the development of new lines.

H. F. Noyes has recently been appointed general manager of the La Follette Coal & Iron Co., with headquarters at La Follette, Tenn. Mr. Noyes recently returned from Australia, where for a number of years he was assistant general manager of the steel department of the Broken Hill Proprietary Co. of Newcastle, N. S. W. Prior to this he was connected with various iron and steel interests, among them being the Dominion Iron & Steel Co. and the Dayton Coal & Iron Co.

## Obituary

EDGAR W. HOUSER, founder of the Houser Elevator Co., Syracuse, N. Y., died at the Clifton Springs Sanatorium on Oct. 15, having suffered a stroke of apoplexy early that morning. He was born at Pompey, N. Y., in 1842 and until ten years ago was president of the company which he founded in 1889.

HARRY C. MALLORY, mechanical engineer and inventor, died in City Hospital, Mount Vernon, N. Y., on Oct. 10, from the effects of an apoplectic attack suffered a week earlier. He was 56 years old and a resident of Bellport, L. I. Mr. Mallory was a member of the Engineers' Club, New York, and of the American Society of Heating and Ventilating Engineers.

WALTER EYERMANN, son of Peter Eyermann, who will be remembered in the United States in connection with the introduction of blast furnace gas engines in the United States, died at Mürzzuschlag, Styria, on Sept. 29. He was born in Cleveland, Ohio, 20 years ago. For several years he had been in training in metallurgical engineering, his father having charge at Vienna of the Austrian Government's operations in iron and steel.

## IRON AND STEEL IN BRAZIL

Company in Minas Geraes Gets Forty-Year Subsidy Under Certain Conditions—Reports from Other Countries

A recent Brazilian federal decree granted the Companhia Siderurgica Belgo Mineiro, Sabara, State of Minas Geraes, special concessions for a period of 40 years provided it complies with certain federal laws with reference to subsidy of steel plants. Assistant Trade Commissioners Cremer and Connell report to the Department of Commerce. This company at present has operating one blast furnace and plans to erect another as well as an open hearth furnace and two rolling mills.

The Companhia Electro-Metallurgica of Ribeirao Preto, State of Sao Paulo, reports a production for the first half of 1923 of 1382 metric tons of electric furnace pig iron and 2561 tons of steel from Bessemer converter and electric furnaces.

It is reported from both Rio de Janeiro and Sao Paulo that the iron and steel import market is quiet. Existing stocks at the end of August were low and buying for future deliveries from foreign sources light.

### Australian Steel Industry Again Active

It is reported that from January to May, 1923, the Broken Hill Proprietary Co.'s steel works at Newcastle, N. S. W., produced 40,070 long tons of steel products, including 27,691 tons of rails. At present the plants are working on large orders of rails for the Commonwealth, Vice Consul W. T. Costello, Newcastle, informs the Department of Commerce.

### French Production of Iron Ore

The total iron ore mined in France in July, 1923, amounted to 1,833,121 metric tons, against 1,891,257 metric tons during June. There is a new increase in the stocks at the mines, 4,635,273 metric tons on July 31, against 4,579,879 metric tons on June 30 last.

### Czechoslovakian Iron and Steel Exports

According to a report received by the Department of Commerce from Acting Commercial Attache H. L. Groves, iron and steel exports from Czechoslovakia for the first half of 1923 amounted to 330,020 metric tons. Of this total 180,000 tons went into Germany, 35,000 tons to Poland, and 20,800, 15,300, 14,600 and 8200 tons, respectively, into Roumania, Hungary, Austria and Switzerland.

## Will Investigate Strike of Nova Scotia Steel Workers

TORONTO, Oct. 16.—The Royal Commission appointed by the Federal Government to investigate the Sydney, N. S., steel strike will, it is understood, confine its activities to the dispute between the British Empire Steel Corporation and its steel workers. Through some misunderstanding it was announced that the scope of the inquiry would be widened to include the coal mining industry in Cape Breton. It is pointed out, however, that the coal miners are working under a contract which does not expire until next January, and that when they went out on strike at the time of the steel dispute they did so "out of sympathy" and not because they had any dispute with the employers as to wages. Moreover, James McLachlan, who was responsible for the coal miners' strike was "out-lawed" by John L. Lewis, head of the International organization in the United States. The whole question has been under consideration by the Dominion Cabinet at one or two recent meetings, and it has been decided that there is no warrant for extending the scope of the commission's investigation. An organization meeting of the commission, which is headed by Dr. J. W. Robertson of Ottawa, will, it is understood, be held in Ottawa immediately, after which the hearings will be opened at Sydney, N. S.

## PROPOSED RAILWAYS IN CHILE

Bill Provides for Use of Surplus Earnings of Present Lines in Construction of Additional Mileage

WASHINGTON, Oct. 16.—A bill calling for the expenditure of considerable sums annually in new railroad construction has recently been approved by the Chilean National Council of State and will shortly be submitted to Congress, according to a report to the Department of Commerce from the Commercial Attache's office in Santiago. It is believed inadvisable to delay longer the construction of lines needed for the development of some of the best agricultural sections of the country.

The bill proposes to finance the new lines with surplus earnings of the existing state railways which are increasing as the result of more efficient management and lessening interest requirements as old railway loans are liquidated.

The bill provides that large deposits be made by the State railway administration during 1923 and 1924, and that preference be given to construction of railroads for which property has been ceded gratuitously or money or materials given by neighboring property owners.

## NEW TRADE PUBLICATIONS

**Air Brush Painting.**—Paasche Air Brush Co., 1909 Diversey Parkway, Chicago. Circular describing outfits for painting tanks, structural steel structures, etc. Illustrations and descriptions of various outfits, with selling prices, are given.

**Diesel Marine Engines—Crosshead Type.**—McIntosh & Seymour Corporation, Auburn, N. Y. An 8-page folder, 8½ x 11 in., describing the reversible type of marine engine, giving details of design and construction, including lubrication and maneuvering gear. The illustrations cover a 1400-hp. engine of six cylinders. The last page is devoted to marine auxiliary generating sets varying from 50 to 300 hp. and from 1 to 6 cylinders.

**Diesel Marine Engines—Trunk Piston Type.**—McIntosh & Seymour Corporation, Auburn, N. Y. An 8-page pamphlet, 8½ x 11 in., featuring the non-reversible engine with the trunk type piston. Illustrations show engines varying from 390 to 960 hp., the smallest ones being maneuvered by hand and the largest by power. Lubrication is featured in some detail, as well as the gear for maneuvering the engine. The last page is devoted to auxiliary generating sets varying from 50 to 300 hp.

**Diesel Engines.**—McIntosh & Seymour Corporation, Auburn, N. Y. In a splendidly illustrated 48-page booklet, 8½ x 11¼ in., featuring the plant where the Diesel engines are built and the design and construction of the engine itself, the company has put forth a story of engines of high efficiency. Both marine and stationary units are covered in detail. Sizes run from 100 to 3000 hp. for stationary engines, and 390 to 3000 hp. for marine engines, 25 ships having been equipped. Among the various users shown in the illustrations are included mine power plants, ice plants, stone quarry machinery, steel plants, sugar mills, oil mills, irrigation, flour mills, cement mills and electric power stations, as well as oil pipe-line pumps, street railway stations, and municipal work.

**Achievement in Motor Ships.**—McIntosh & Seymour Corporation, Auburn, N. Y. In a 36-page pamphlet, 8½ x 11¼ in., have been gathered illustrations and details of Diesel engines designed for marine use. The ships in which they have been installed include tramp steamers, auxiliary schooners, tankers and other types, and the sizes range from 390 to 3000 hp. In one graphic comparison showing ships of identical size preparing for a long voyage, one lighter with fuel oil is shown alongside the motor ship, while three lighters with coal are shown alongside the steamship and the motor ship, because of its small fuel requirements, is able to carry 27 cars more of freight on a total dead-weight tonnage of 10,000 tons.



## Commercial Alloys of Chromium and Steel

(Concluded from page 1041)

ficult and the metal must be worked quite hot, say about 1110 deg. C. Castings are readily made. Shrinkage allowance is about  $\frac{1}{4}$  in. per ft. In the range of 0.6 to 1.5 or 1.75 per cent carbon the cast alloys are machinable or may be made so by heat treatments. Brinell hardness varies, with carbon content, from 200 to 600 in the cast condition.

[The author here discusses the structural constitution of the various alloys, giving photomicrographs.]

### Heat Treatment

**Thermal Arrests:** The alloys with around 0.3 per cent carbon have a feeble thermal critical point at about 575 deg. C. on cooling. Murakami found no thermal arrest in an alloy with 27.5 per cent chromium and 0.28 per cent carbon, but did find a magnetic arrest point  $A_2$  the position of which was not affected by the initial temperature.

**Thermal Treatment:** Alloys up to about 0.5 per cent carbon cannot be hardened by heating and quenching, although some alloys may be made brittle, as described later, and this treatment will show as a slight increase in scleroscope hardness. Higher carbon, 0.7 per cent or more, may be readily hardened by heating to 850 deg. C. or above, and quenching. With higher carbon alloy (1.5 per cent), the quenching may be omitted and hardening obtained by air cooling. Softening will result from heating to about 800 deg. C., slow cooling to 600 deg. C., then more rapidly cooling.

In the experimental work on heat treating the alloys in the lower carbon ranges, that is to harden or soften them, in general, it has not been possible to affect to any extent the appearance of the alloy under the microscope. The solid solution and the carbides do not change their appearance to any material degree.

### Physical Properties

**Transverse Strength:** The transverse strength of castings has been found to vary considerably with the method of casting and the composition of the alloy. As the compositions used in castings have been higher carbon as a rule, the amount of deflection is not high, being only a few hundredths on the standard arbitration bar. Low-carbon alloys show less transverse strength, but an increase in deflection. The following tabulation will indicate the general properties tested transversely:

Specimen	Size	Distances Between Breaking Supports, Load, Deflection.		
		In.	Lb.	In.
0.26 per cent carbon, 27 per cent chromium, cast at high temperature.....	$\frac{3}{4}$ in. sq.	12	1,650	0.2
Ditto, cast at low temperature .....	$\frac{3}{4}$ in.	12	3,350	0.53
Carbon 1.16 per cent, chromium 21.17 per cent, average five tests.....	$1\frac{1}{2}$ in.	12	8,370	none
Carbon 2.63 per cent, chromium 26.72 per cent.....	$\frac{3}{4}$ in. sq.	4	12,510	none

**Tensile Tests:** The physical properties of one forged alloy are shown in Fig. 11 which depicts the results of tensile tests on an alloy containing 0.53 per cent carbon, 24.45 per cent chromium, 0.39 per cent silicon, and 0.10 per cent manganese. The metal for these tests was rolled to  $\frac{1}{4}$ -in. plate from 5 by 5-in. ingots, the plate being sheared to strips, which were then side milled to give flat tensile specimens; the flat faces were not machined. They were then drawn at the various temperatures indicated. As the carbon content is raised, the tensile strength increases and ductility decreases.

The results of some tensile tests made at high temperatures are shown in Fig. 12. Comparison of the results with those obtained by investigators for various steels shows a high tensile strength at elevated temperatures. Experiments are being carried on to determine the effect of several additional elements on the tensile properties at high temperatures, such as cobalt, vanadium, uranium, copper and molybdenum. Increase of carbon raises the tensile strength, that is, the knee of the curve characteristic of the temperature-tensile tests of steels is pushed toward the right. The prop-

erty of high tensile strength at elevated temperatures is useful and important for an oxidation-resistant alloy and it is becoming of increasing importance, especially in the oil-cracking industry. It is thought that the useful properties of alloys of this nature are as yet only partly realized.

Tensile properties of cold-drawn wire without subsequent treatment have shown breaking stresses of 112,000 lb. per sq. in. and 11.5 per cent elongation in 2 in. for 0.045-in. wire and 180,000 lb. per sq. in. with 1.5 per cent elongation on 0.021-in. wire. Both wires were low-carbon alloys.

When considering the diverse requirements of the mining and metallurgical industries for materials of high resistance to various forms of attack, it is impossible to recommend any given composition as a cure all; each case must be decided in the light of the particular service conditions. Among the many alloys on the market, some of which have given after years of satisfactory service, it is possible to fit most of the conditions up to 1000 deg. C. or more. One alloy may be forgeable, but is exceeded in strength at high temperatures by an alloy that is non-forgeable; still another alloy may excel in acid resistance and fail in oxidation at more than red heat and so on. To date no one combination has been found to possess the maximum merit under all conditions of service. It is believed by the writer, however, that the general possibilities of numerous alloys in the high-chromium ranges are not yet sufficiently appreciated by the engineering profession. It is also believed that many technical processes can be carried out at a higher efficiency by the installation of equipment which will, in general terms, permit the more efficient transfer of heat, the boosting of temperature and pressure, and the less frequent necessity of shutdowns for repairs. Already installations of the high-chromium or chromium-nickel alloys have been made, or are being discussed, in the walls and hearths of roasters, for heat interchangers of various types, in oil-cracking stills, in the manufacture of ammonia, fuel-burning equipment, chemical manufacturing plants, and in lines where we have not before conceived of the use of metals or alloys.

### Unusual Boiler Efficiency

Tests by the United States Shipping Board and the Bureau of Mines have shown a combined efficiency of nearly 85 per cent obtained from a Scotch marine boiler, superheater and airheater, using oil for fuel and forced draft. The boiler is a single ended 3-furnace unit, with separate combustion chambers. The heating surface is 3022 sq. ft.; superheating surface, 774 sq. ft.; and air-heating surface, 1220 sq. ft. The tubes contain retarders.

In a test lasting 8 hr., in which 6704 lb. of fuel oil were burned, the heat balance shows the heat absorbed by the boiler and superheater as 84.6 per cent of that furnished by the fuel. The total water feed aggregated 97,635 lb., or 14.57 per lb. of oil fired. The boiler pressure was 170 lb. per sq. in., with steam superheated 24 deg. Fahr. Gas temperatures include 533 deg. when leaving the boiler, 470 deg. from the superheater and 341 deg. at the exit from the air heater. The feed water temperature was 188 deg. The heating value of the fuel was given as 18,193 B.t.u. per lb.

### Stack Gas Analyses From Commercial Blast Furnaces

The cooperation of two large steel plants in Alabama has been obtained by the Department of the Interior for experimental work in taking gas samples from the mantles of two commercial blast furnaces. These companies have signified their willingness to drill holes through the shell and lining of their furnaces to permit taking gas samples from a number of elevations of the mantles. These samples will be used in a study of the reactions taking place in the stacks of commercial furnaces. This work is being done under the direction of the Minneapolis experiment station of the Bureau of Mines.

## Labor Unions in Field of Banking

(Concluded from page 1039)

as one of the unexpected results of labor's invasion of the field of finance.

"Labor banking is exerting pressure for change in trade union methods in many different directions. For one thing, it is exerting an increasing pressure for the abandonment of the strike and the ultimate substitution of labor's money power as a more effective weapon for the workers' defense, and as an instrument for their advancement."

### Mobilizing Financial Resources

Mr. Boeckel, as author of a recent book entitled "Labor's Money," published by Harcourt, Brace & Co., New York, interestingly analyzes the movement started by labor to mobilize its financial resources, its causes, its results up to date and the purposes of the movement. The narrative is set forth comprehensively, and whether one does or does not agree with statements recorded by Mr. Boeckel, they invariably attract deep attention and make it manifest that the movement is of a profound character, as it affects organized labor and the relationship between employers and employees.

A portion of the comment concerns workers in the steel industry as stockholders. It is declared that the experiences of the United States Steel Corporation in the years immediately following the World War had shown profit sharing through stock distribution to be an effective barrier against successful organization of the workers along the world trade union lines.

"The old trade union leaders have always been opposed to profit sharing in all its forms," says Mr. Boeckel. "They have been successful in many cases in forcing abandonment by employers of the so-called bonus plans, but seldom have been able to make headway against profit sharing through the distribution of stock. The reason for their opposition to profit sharing is clear. To just the extent the workers become interested in increasing the profits in which they are entitled under the various plans to share, they lose interest in trade union organization to coerce employers through actual or threatened interference with those profits."

Mr. Boeckel sets forth at length employees shareholding in various corporations, among them the International Harvester Co., the Westinghouse Electric & Mfg. Co., the Republic Iron & Steel Co. and the National Lead Co. He credits the United States Steel Corporation with being the pioneer in employees' stock distribution, and outlines the plan of the corporation in this connection. The effect this has on relationship between employees and employers is denoted when Mr. Boeckel declares that: "When the great steel strike of 1919 was planned by outside trade union leaders, no account was taken of the large stockholdings of employees of the United States Steel Corporation as either an asset or a liability in labor's effort. The contest was conducted as other contests had been conducted in the past, as if these large stockholdings did not exist. Its purpose was to organize the steel industry for collective bargaining."

"And when the strike had resulted in complete failure, it was immediately announced from labor headquarters that a new effort to organize the steel industry by the same method would be undertaken as soon as the time was ripe."

### Effort of William Z. Foster

The author then comments upon the efforts made by William Z. Foster in undertaking this abortive strike and declares that it was not the insistence of the United States Steel Corporation and the independents upon the open shop principle in their own plants so much as their efforts to bring about open shop conditions in other industries that convinced organized labor that the steel industry must be unionized, no matter at what cost. But the cost was very great, Mr. Boeckel declares, and the steel industry was not successfully unionized. He adds: "Nor is there is any

prospect that it will be successfully unionized, along the old trade union lines, at any time in the near future."

Mr. Boeckel makes the interesting prediction that it would be possible for the employees of the Steel Corporation to possess a working majority of all the Steel Corporation stock outstanding in 1928, when they would own 2,576,703 shares, upon the assumption that the stock now held remains in the possession of the employees and that they will continue in succeeding years to buy from the Steel Corporation or in the open market the same number of shares purchased in 1921. He presents a table showing a decided falling off in employees' stock subscriptions during 1922, and it is declared that the report for that year of Charles L. Close, manager of the Steel Corporation's Bureau of Safety, Sanitation and Welfare, indicates that only about one-half the stock purchased under the stock subscription plan remained in ownership of Steel Corporation employees.

In a chapter devoted to buying control of employee stock ownership, Mr. Boeckel declares that the investment of employees of the Steel Corporation in Steel common stock is about 20 times as great as that of the street railway employees in Philadelphia Rapid Transit stock. But this investment, it is pointed out, has not been made in any organized way or for any common purpose such as inspired the Philadelphia street car men. At this point Mr. Boeckel says, "Only about one-third of the employees in the mines, mills, furnaces and offices of the United States Steel Corporation are stockholders. Stockholding employees gave evidence, however, as early as 1914, of a readiness for organization along investment lines. Had they been so organized at that time under capable leadership, inside or outside the steel industry, a strike of steel workers in 1919 would have been as remote a possibility as a street car strike is today in Philadelphia."

### Possibility of Control by Employees

Mr. Boeckel says that it has been authoritatively stated that directors of the United States Steel Corporation have at no time owned more than 2 per cent of its outstanding stock. He dwells upon the possibility of employees gaining control through "investment to the utmost." He comments upon the periods of depression in the trade when workers are laid off and builds up the hypothesis that a new directorate had been voted into control of the corporation's affairs at this time (1921), "a directorate responsible to stockholding workers in the steel industry, and not to investment bankers, representing the interests of large absentee stockholders. Would this new directorate not have conceived its first duty to the provision of steady employment for stockholding workers?"

Mr. Boeckel theorizes about the employees, after getting into control, securing large orders for steel by making drastic reductions in steel prices. He concedes that dividends might be sacrificed in the process and even that it might be necessary to go farther and cut wages in order to provide full-time employment, but that workmen-stockholders could well afford the loss in dividends, and even a cut in wages, if given steady work in exchange. Mr. Boeckel declares that before workers can assume real control of any large producing corporations through stock purchase, agencies capable of financing large scale industrial operations must be built up in their control. The credit resources of the existing labor banks, he points out, are not adequate for this purpose. He urges that the labor banks must obtain the confidence of the entire working public in order to attain success. He declares that when the need arises labor will have financial agencies capable of supplying both credit and new capital in adequate volume.

"The real contest will not be with the present owners of industry," says the author. "Many of these may, indeed, come over to the workers' side. The real contest, if there is a contest, will be with the present controllers of industry, the investment bankers. Labor can meet the investment bankers on fairly even ground whenever it mobilizes its full money and credit power under its own control."



## STEEL AND INDUSTRIAL STOCKS

The range of active steel and industrial stocks from Monday of last week to Monday of this week was as follows:

	Low	High		Low	High
Allis-Chalmers ..	39 1/2	42	Int. Har. ....	72	75 1/2
Allis-Chal. pf. .	92 1/4	92 1/2	Jones & Laugh'n.	108 1/4	108 3/4
Am. B. S. & Fdy.	70 1/2	71	Lima Loco. ....	62 1/2	64 1/2
Am. B. S. & F. pf.	103	103	Midvale Steel ..	25	25 1/2
Am. Can. ....	83 7/8	92 1/2	Nat.-Acme .....	9	9
Am. Can pf. ....	106 1/2	106 3/4	Nat. En. & Stm..	42 7/8	46 3/4
Am. Car & Fdy.	155 7/8	158	Nat. En. & S. pf.	92 1/4	92 1/4
Am. C. & F. pf.	117 1/2	118 1/2	N. Y. Air Brake.	36	36 7/8
Am. Locomotive.	68 1/4	70 1/2	Otis Steel .....	7	7 1/4
Am. Loco. pf. ....	117	117	Otis Steel pf. ....	47 1/2	47 1/2
Am. Radiator ..	80 1/2	81 1/4	Pressed Steel Car	48	48
Am. Steel Fdries.	34	34 3/4	Pressed Steel pf.	85	85
Bald. Loco. ....	114	118 3/4	Replogle Steel ..	9	10
Beth. Steel .....	46	49 1/8	Republic .....	42 1/4	44
Beth. Stl. 7% pf.	90 1/4	90 1/4	Republic pf. ....	85 1/2	85 1/2
Beth. Stl. 8% pf.	103	103	Sloss-Sheffield ..	40	42
Br. Em. Stl. 2 pf.	15 1/2	16 1/2	Steel of Canada.	65 1/4	66
Chic. Pneu. Tool	77	81	Superior Steel ..	24	24
Colo. Fuel .....	25 1/2	27	Un. Alloy Steel..	30	30 1/2
Crucible Steel ..	58 1/2	61	U. S. Pipe .....	35 1/4	40 3/4
Crucible Stl. pf.	86	87	U. S. Pipe pf. ....	78 1/2	82 3/4
Deere pf. ....	63	63	U. S. Steel .....	86	88 1/2
Gen. Electric ...	169 3/4	171 1/2	U. S. Steel pf. ....	118 3/4	119 1/4
Gt. No. Ore Cert.	28	29	Vanadium Steel.	27 1/2	28 1/2
Gulf States Steel	71 1/2	79 3/4	Va. I. C. & C. pf.	81	81
Gulf St. Steel pf.	98 1/4	98 1/4	Whouse Air Br.	81	82
Harbison-Walk..	115	115	Y'gstown S. & T.	65	65 1/2
Inland .....	35 1/2	36			

## Pittsburgh Steel Co. Report

Annual report of the Pittsburgh Steel Co. and subsidiary companies for the fiscal year ended June 30, last, just published, shows a net income of \$2,022,473 after charging \$1,427,092 for depreciation and depletion, \$97,840 for a reduction of inventory values and including in operating costs \$2,322,682 for maintenance, repairs and replacements. After paying the regular dividends of 7 per cent on the preferred stock and 4 per cent on common, amounting to \$1,295,000, there remained a balance of \$727,473, which was added to surplus. Total sales for the year were valued at \$29,117,117, an increase of \$13,176,172 over the total for the previous year. The company is in a strong financial position, having current assets of \$14,116,407 against liabilities of only \$2,566,033, the balance sheet shows.

## Industrial Finance

The K. & F. Mfg. Co., Kenosha, Wis., manufacturer of metal stampings, tools, dies, and metal specialties, is defendant in involuntary bankruptcy proceedings instituted Oct. 9 by creditors with aggregate claims of \$3,348, who claim the indebtedness is upward of \$100,000. Assets of approximately \$150,000 are claimed. Horace G. Maddock was appointed receiver and instructed to maintain the enterprise as a going concern. Matthew H. Kavanagh is president; Frank L. Kavanagh, vice-president and general manager, and M. E. Kavanagh, secretary-treasurer.

The Milwaukee Rolling Mills Co., manufacturer of galvanized, blue and black annealed sheets, is entertaining offers made by the Inland Steel Co., Chicago, for the purchase of its entire capital stock, according to a statement made by John I. Beggs, president of the Milwaukee company. The mills were built in 1920 with an investment of \$1,500,000 and are employing 1000 men. The annual capacity is 60,000 tons. Boyd B. Jack is general manager.

The Continental Can Co. reports net income for the first eight months in 1923 of \$2,868,790, after depreciation and Federal taxes. Surplus for the period after provision for preferred and common dividends was \$2,301,424. The balance sheet as of Aug. 31 showed surplus of \$5,257,220, including \$1,485,000 applied in redemption of preferred stock.

The Charcoal Iron Co. of America shows net earnings for the first six months of 1923 before depreciation of \$56,784.

## Trade Changes

The Robinson-Wagner Co., Lafayette, Ind., recently incorporated with \$500,000 capital stock, will manufacture agricultural wagons and trucks, and commercial bodies. The plant of the Indiana Wagon Co. has been taken over and production is now under way. A. L. Waters is general sales manager.

The Holland Mfg. Co., Central Avenue and Bank Street, Baltimore, recently incorporated with \$200,000 capital stock, will manufacture nails, tacks, sheet metals and like products, continuing a business established in this line. Franklin Holland and J. Monroe Holland are the principals.

The Flexo-Common-Lath Co., 800 A. G. Bartlett Building, Los Angeles, Cal., has been incorporated with capital stock of \$500,000 to manufacture building materials, including lath. Machinery will be built in Los Angeles and installed in mills in various parts of the country. Frank J. Hellmann

is president; Walter J. Lumbleau, vice-president and general manager; V. C. Vaughn, secretary-treasurer.

The Davis Transportation Lines, Inc., with offices at 50 Union Square, New York, and operating headquarters at Pier 30, East River, has been organized as successor to the Davis Transportation Co., and will operate a combined freight steamer and truck service. The management passes into the hands of a new group headed by Matthew C. Brush, president American International Corporation and George E. Whitlam, formerly president International Products Co. of South America. Mr. Brush will be chairman of the board of directors.

The Blacker Engineering Co., Inc., New York, manufacturer of Blacker blacksmithing hammers, has appointed George Hess, Pittsburgh, as district representative with office at 421 Wood Street.

The Otis A. Smith Mfg. Co., Middlefield, Conn., maker of wrenches, nipples and small hardware, has been purchased by Nesbit & McKinney, New York, who will continue the business. The Middlefield company has been in business for 75 years. The plant consists of several units.

The Mazda lamp division, General Electric Co., Central Falls, R. I., within a month will be moved to the company's new plant at East Boston. The General Electric Co. acquired the Central Falls plant in 1907 and employed 350 to 600.

The A. Leschen & Sons Rope Co., St. Louis, manufacturer of wire rope, has leased a new building at 808 West Washington Boulevard, Chicago, for an office and warehouse.

The Republic Radiator Corporation, Utica, N. Y., has changed its name to Lincoln Radiator Corporation. Personnel remains the same.

## Plans of New Companies

The Conveyor Mfg. & Supplies Co., 53 Garden Street, Passaic, N. J., organized with 2000 shares of no par value stock, will manufacture conveying equipment and supplies. Most of the work is being done in the companies plant but contracts likely will be let for wheels and belting. Repair work on conveyors also will be done. William H. Trowbridge is president.

The American Temperature Regulator Co., 286 Lyons Avenue, Newark, N. J., has been organized by the Frank A. Gentsch interests, 401 Kinney Building. The company will distribute and install heat regulating instruments of the American Radiator Co. Mr. Gentsch is manager.

Zuill & Jones, Inc., Cazenovia, N. Y., recently organized to manufacture engines, will confine activities for the present to operating a general repair shop and garage.

Rainear, Inc., Philadelphia, has been organized to manufacture steam supplies and plumbing equipment. No building will be done for a time. Address care of Victor Frey, Land Title Building.

L. B. Underwood & Co., Inc., Pittsburgh, recently organized, will act as manufacturers' agents, now representing Durham & Co., Cole Metal Box Co., Nyelec Switchboard Co. and the Auth Electric Specialties Co. Address in care of Edward H. Flood, 451 Frick Annex.

The Precision Machine Works, Inc., Hohokus, N. J., is successor to the Precision Motor Regrinding Co. R. C. McWane is president and Arthur L. Ferris superintendent. The company makes a specialty of rebuilding automobile motors.

The Cutaway Harrow Co., Higganum, Conn., incorporated with capital of 1500 shares of common stock and paid in capital of \$75,000, will manufacture harrows and agricultural tools. Final plans have not been decided but a plant now owned will suffice for immediate needs. E. S. Hubbard is president; E. R. Austin, vice-president, and A. H. Hubbard, secretary-treasurer.

The Acme Steel Construction Co., 720 Park Building, Pittsburgh, organized to manufacture iron and steel products, has obtained a shop under lease and will soon be on full scale operation. J. Frank Pepper is one of the principals.

The Decker Mfg. Co., 255 Meldrum Avenue, Detroit, has been incorporated with capital stock of \$60,000 to manufacture automobile enclosures. No building will be done for a time. William J. Decker is president; A. B. Hoffman, vice-president and treasurer, and W. F. Tant, secretary.

An organization of bondholders has bought property and buildings from a receiver's sale and has organized as the Metal Stamping & Mfg. Co., with capital stock of \$150,000. Address in care of Quay H. Findley, 815 Cuyahoga Building, Cleveland.

The Automatic Assorting Machine Co., 404-05 Evening Star Building, Washington, incorporated with \$100,000 capital stock, will manufacture special machinery and parts. It has not been decided definitely whether the company shall build or let out its work to contract. Howard C. McClintock is secretary.

The Brooks Steam Motors, Inc., 1304-07 Canadian Pacific Railroad Building, Toronto, Ontario, has been incorporated with \$5,000,000 capital stock under Delaware laws, to manufacture steam-driven automobiles and trucks. Like the parent company, Brooks Steam Motors, Ltd., it will likely do assembling processes first and manufacture later on. C. H. Hern is one of the heads.

The National Stamping Co., St. Joseph, Mich., has been organized to manufacture stamped steel products, specializing in connecting rod and main bearing shims, as used in automobile motors. Arthur A. Karcher is president and general manager.

The Beisel Spring Wheel Corporation, New York, incorporated with 1000 shares of no par value stock, has been organized to manufacture automobile wheels. Plans are unknown. Incorporators are W. J. and J. R. Beisel and H. L. Fish. Address care of Mr. Montross, Conklin & Montross, 59 Wall Street, New York.

The Actna Automatic Oil Burner Co., New York, has

been incorporated with capital stock of \$3,000,000 to manufacture oil burners and oil burning equipment. John Schmeniger, Jr., who is organizing the company, is now manufacturing in Providence for that territory. The new company will establish a plant in New York to manufacture for the adjacent territory. Other incorporators are D. J. Deasy and E. Celler.

According to an announcement from Kenosha, Wis., the plant of Winther Motors, Inc., sold at trustee sale to a creditors' committee, will be one of the units in a merger of truck companies to be known as the Amalgamated Motors Corporation, with capital stock of \$1,000,000. Other plants involved are the Bessemer Truck Co. and the American Motors Co. Operations are expected to commence within 30 days.

The F. R. Phillips & Sons Co., Philadelphia, has moved its New York office from 50 Church Street to room 1005, 90 West Street. Management of the New York office was recently taken over by Waldo L. Phillips.

## BOOK REVIEWS

**"The Iron Ores of Lake Superior."** By Crowell & Murray, Cleveland. Page 332 + vi, 5 3/4 x 9 in. Published by the Penton Press, Cleveland.

In bringing out this fifth revised edition, the authors have introduced several new chapters, revised the tables to bring them up to date, redrawn some of the maps and added several charts. The book has long been regarded as authoritative in respect to the properties developed on the various Lake Superior iron ranges, one of its sections being a complete directory of the iron mines with analyses of ores produced, names of operators, superintendents and managers of sales, and records of production. The various classes of ores found in the Lake Superior region are indicated and defined and there are chapters on mining methods, ore sampling and methods of analyses. Among special articles is one by R. C. Allen on "Iron Ore"; another by B. D. Quarrie, general manager Otis Steel Co., deals with the "Operation of the Blast Furnace." A valuable feature of the work are the maps of the various ranges.

**Elasticity and Strength of Materials, Section III.** By C. A. P. Turner. Pages 122 + vi, 6 x 9 in. Published by the author, Minneapolis, 1923. Price \$5.

Dealing with the theory of torsion in shafting and with double bending of plates, this section of the work covers chapters 12 to 16, inclusive, and is illustrated by appropriate line cuts, including stress and strain diagrams, loading diagrams, and bond stresses for reinforced concrete work. The story has been carried out as a problem in mechanics with only a moderate use of calculus, and depending in a large way upon results of observation of materials in practice.

Two chapters are devoted to torsion, the first being an analysis of round shafts, while the second is a torsional analysis of square, rectangular, triangular and oval prisms. The next two chapters cover bending and twisting resistance in plates, one chapter being devoted to homogeneous flat plates, while the other takes up composite plates and the theory of continuity with variable moment of inertia. These two chapters are the most extensive of the book, covering more than 80 pages of the total. The fifth and concluding chapter of this volume is devoted to unbalanced moment in monolithic floors and columns. It deals with moments and deflections in loaded spans of continuous beams and with unbalanced loads on a floor resting on a rectangular system of continuous girders made integral with their supporting columns.

Together with its preceding volumes, this work should be of great value to engineers engaged in the design of reinforced concrete structures. It uses graphic analyses in studying the flexure of plates and thus gives the student a concise conception of the relation between stress and deformation, which should in time eliminate fundamental errors in the rules of design in building codes.

"Forty Thousand Better Foremen" is the title of an impressive pamphlet of 48 pages, 9 x 12 in., published by the Business Training Corporation, New York. It is sent out as "a record of experience in developing greater cooperation and productivity among 40,000 foremen in over 600 representative industrial companies." On an early page is a letter from John Calder, director of the course in modern production methods, addressed to William H. Lough, president of the Business Training Corporation, from which it appears that the system of training for foremen in modern production methods dates back only five years, or to 1918. In addition to the fact that nearly 40,000 foremen have gone through the training, two statements are emphasized—that over 84 per cent of the home study called for in the training plan has actually been performed, and that at least three-quarters of all the foreman training in the United States in the past five years has been conducted through the course in which Messrs. Calder and Lough have cooperated. The pamphlet gives much space to the procedure in connection with the training classes that have been organized and to testimony from various companies and groups that have carried on the work.

In a pamphlet entitled "A Pickling Prescription," Marsh & Cochran, Youngstown, Ohio, deal with the matter of acid wastes in pickling shops, particularly the unused acid that passes into the sewer, when vats of "spent" liquor are let down, and the waste due to using more acid to pickle than is necessary. A table is given showing the per cent of sulphuric acid wasted in discharged liquor and in a second table data are given showing the relation between acid used, in pounds, and the amount of surface pickled, the latter unit being used instead of the weight, in tons, of steel pickled. This table permits of calculating the surface of irregular stamped objects as well as flat sheets. Other tables give specific gravities and water and acid percentages of pickling solutions.

## New Books Received

**Condensed Catalogs of Mechanical Equipment.** Pages 678, 8 1/2 x 11 1/2 in.; illustrated. Published by American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York. Price, \$5 a copy.

**The Mineral Industry.** Statistics, Technology and Trade during 1922. Edited by G. A. Roush, A.B., M.S., associate editor Allison Butts, A.B., B.S. Pages 6 1/2 x 9 1/2 in. Published by McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York. Price, \$12.

**Workmen's Compensation Legislation of the United States and Canada, 1920 to 1922.** Bulletin 332 of U. S. Bureau of Labor Statistics. By Lindley D. Clark. Pages 260, 6 x 9 in. Published by Government Printing Office, Washington. Price, 25 cents.

**Mineral Resources of the United States, 1920.** Part I, Metals. By G. F. Loughlin, United States Geological Survey. Pages 611, 6 x 9 1/4 in.; illustrated. Published by Government Printing Office, Washington.



# Machinery Markets and News of the Works

## MARKET IS MORE ACTIVE

### Large Buying by Automobile Interests Is the Feature

### Further Railroad Purchases Also, but Industrial Companies Are Doing Little

A turn for the better has come in some branches of the machine-tool industry, the improvement being due mostly to renewed buying activity among automobile interests. The Ford Motor Co., Detroit, has placed large orders with a view to increasing its capacity to 7000 to 10,000 cars daily. One order for special production lathes, totaling about \$400,000, went to an Eastern machine-tool company. The Willys-Morrow Co., Elmira, N. Y., affiliated with the Willys automobile interests, also placed large orders, said to aggregate about \$600,000, and there has been other automobile buying. The Continental Motors Corporation, Muskegon, Mich., has been a steady buyer for some time past. Small orders have been placed within the past week by the Chevrolet, Buick and Maxwell companies and by the Canadian Products Co., Walkerville, Ont. a General Motors subsidiary. The White Motor Co., Cleveland, has issued an inquiry for several tools.

## New York

NEW YORK, Oct. 16.

THE Willys-Morrow Co., Elmira, N. Y., which is affiliated with the Willys automobile interests, placed large orders last week for machine tools and special automatic machines. Its expenditures are said to have reached a total of several hundred thousand dollars. This is the largest buying in the East in some months. General buying by industrial companies is at low ebb, but the railroads are still inquiring and placing orders for a few machines. The Lehigh Valley put out an inquiry last week for a half dozen tools and the Delaware, Lackawanna & Western inquired for an engine lathe, shaper and bushing press. The American Locomotive Co. still has a few machines to buy against an inquiry sent out some time ago. The New York Central has been one of the steadiest buyers of the year, but its orders have been in small units and consequently have not attracted the attention that is accorded to purchases of large lists.

William P. Brew, 50 Church Street, New York, announces that he has engaged in the buying and selling of manufacturing equipment of special types, for which there is at present no outlet. Most of the second-hand machinery dealers confine their activities largely to metal-working machine tools, but Mr. Brew will specialize in machines used in various industries.

The Ulster Iron Works, Dover, N. J., is in the market for a 10 x 10 vertical engine, State make.

Bids will be received by Edward S. Walsh, commissioner of canals and waterways, Albany, N. Y., until Nov. 3, for a new power house at Lock No. 29, Palmyra, N. Y., and incidental work. Plans at the office of the Bureau of Canals, Capitol Building.

The New York Dock Co., 44 Whitehall Street, New York,

Japanese buying is beginning. A Cleveland manufacturer received an order for eight automatic screw machines for an arsenal in that country and numerous inquiries are pending. A Japanese house in New York has been getting prices on 50 engine lathes. The Westinghouse interests have received orders from Japan for \$1,000,000 worth of electrical apparatus.

The Pennsylvania Railroad, Central Region, after much delay, has distributed orders for quite a number of tools, most of the business going to dealers in Pittsburgh. The New York Central continues to buy, and while most of its orders have been for small lots, the aggregate this year places this road among the largest railroad buyers of tools. The Lehigh Valley put out an inquiry last week for a half dozen tools, the Delaware, Lackawanna & Western inquired for three and the Illinois Central has asked for prices on a few machines.

The Pettibone-Mulliken Co., Chicago, railroad specialties, has received bids on 26 tools. The American and Lima locomotive companies have a few tools to buy.

The American Sheet & Tin Plate Co., Pittsburgh, which inquired some time ago for 12 tools, is expected to buy this week. An order for \$25,000 worth of tools was placed at Chicago by the Public Service Co. of Northern Illinois for its Waukegan, Ill., power plant.

has plans for a two-story addition at its works, 88-106 Commerce Street, Brooklyn, to cost \$22,000. L. E. Driver, 334 Furman Street, Brooklyn, is architect.

The Electric Equipment Division, Department of Commerce, Washington, has available information of a company, including names of officials recently formed at Caracas, Venezuela, to construct and operate a hydroelectric power plant on the Caruso River, with capacity of 3000 hp., and transmission line about 37 miles long, file No. 105419.

The Ford Motor Co., Highland Park, Mich., has acquired the plant of C. E. Johansson, Inc., Poughkeepsie, N. Y., manufacturer of gages and precision instruments. It is purposed to continue the operation of the plant, with later expansion for requirements for Ford automobile manufacture. The purchase is said to include, also, the works of the company in Sweden.

Manual training equipment will be installed in the two-story high school to be erected on the Boston Post Road at Palmer Avenue, Mamaroneck, N. Y., estimated to cost \$450,000. Edward Hahn, 290 Fulton Street, Hempstead, L. I., architect, will take bids in the near future.

The board of directors, Albany City Hospital, Albany, N. Y., will soon call for bids for the installation of a steam power house at the institution, to cost \$30,000. J. G. Brennan is city engineer.

Fred Hawley, 244 West Forty-second Street, New York, is planning for the purchase of a motor-driven bandsaw.

The American Brass Co., 25 Broadway, New York, a subsidiary of the Anaconda Copper Mining Co., same address, has purchased the plant and property of the National Conduit & Cable Co., Inc., Hastings-On-Hudson, N. Y., and will take over the works to develop maximum output of copper wire, cables, conduits, etc., under a present rating of 5000 tons per month. Ralph E. Day, formerly superintendent of one of the purchasing company's plants at Waterbury, Conn., will be in charge of the acquired works, for which it is said \$3,000,000 was given.

Bids for electrically-operated pumping machinery, screening equipment and other mechanical equipment for a

drainage works in British India, estimated to cost \$3,000,000, will soon be asked. Full information on file at the office of the Bureau of Foreign and Domestic Commerce, Washington. Reference 105,736.

The Columbia Machine Works & Malleable Iron Co., Euclid and Atlantic Avenues, Brooklyn, has awarded contract to the McClintic-Marshall Co., 50 Church Street, New York, for a new machine shop and foundry to replace the portion of its works recently destroyed by fire. Holmes & Winslow, 134 East Forty-fourth Street, New York, are architects.

Fire, Oct. 8, destroyed a portion of the plant of the Troy Foundry & Machine Co., Watervliet, N. Y., with loss estimated at \$60,000 including equipment. The company is now operating under a receivership.

The New System Motor Sales Corporation, 236 West Fifty-fifth Street, New York, has leased the entire building at 649-55 West Fifty-fifth Street, for new works, a portion of the structure to be used for a machine shop and general repair department.

The One Hundredth Street Dock Co., 429 East 100th Street, New York, has plans for a one-story automobile service and repair works, 100 x 200 ft., for company cars. S. J. Sheridan, 5646 Newton Avenue, is architect.

The New York Machinery Co., 200 Fifth Avenue, New York, is planning the purchase of a pipe threading and cutting machine.

The General Motors Corporation, 224 West Fifty-seventh Street, New York, has awarded a contract to the H. K. Ferguson Co., Cleveland, for a new automobile manufacturing and assembling plant in the vicinity of Yokohama, Japan.

The Todd Dry Dock & Construction Corporation, 25 Broadway, New York, and Weehawken, N. J., will remove the floating dry dock at Edgewater, N. J., formerly owned by the Lord Dry Dock Co., recently leased from the United States Shipping Board, to the plant of the Tietjen & Lang Dry Dock Co., Seventeenth Street, Hoboken, N. J., a subsidiary, where additional ship repair equipment and facilities will be provided.

Power equipment, ovens, conveying and other machinery will be installed in the new six-story and basement addition to be erected by the Goodman Baking Co., 638 East Seventeenth Street, New York, estimated to cost \$150,000, for which a general contract has been awarded to the Fleischman Construction Co., 531 Seventh Avenue. The McCormick Co., Inc., 41 Park Row, is architect.

The Meeley Tire & Rubber Co., Garfield, N. J., recently organized, has taken over the local plant of the Armstrong Rubber Co., for the manufacture of automobile tires. It is proposed to develop the works to an output of 2500 tires per day. George G. Meeley is president.

Igoe Brothers, Poinier Street, Newark, manufacturers of nails, spikes, etc., will build a one-story addition, 114 x 135 ft.

The Clothel Co., 96 West Seventh Street, Bayonne, N. J., manufacturer of refrigerating machinery, has filed plans for a one-story general repair shop.

## New England

BOSTON, Oct. 15.

**M**OST machine tool houses report no improvement in business the past week, and prospects are as scarce as ever. Some, however, are doing a little better than heretofore, particularly those handling used as well as new equipment. In cases where better business is noted sales involve a limited variety of machines, which implies that large industrial plants are not buying much equipment. A large textile machinery maker, one of the mainstays of the machine tool market for months, is inquiring for special equipment only, and in limited amounts. Other large industries evidently find it to their advantage to let work outside rather than to invest in new equipment.

A new 14-in. x 6-ft. lathe to a Cambridge, Mass., manufacturer, a new 20-in. x 16-ft. lathe to a textile machinery maker, a 16-in. shaper to a Massachusetts paper goods firm; a 14-in. motor driven lathe to go on a steamer sailing from this port, a similar tool for a South American concern, a ball bearing drilling machine to a Chelsea, Mass., firm, three power presses, one going to a Maine and two to a Florence, Mass., shop, two used upright drills, two used lathes and a used Jones & Lamson to a Holden, Me., shop,

## The Crane Market

Business in overhead cranes is still confined to inquiries for cranes of small capacity, generally hand power. Inquiry for locomotive cranes is extremely light in the New York district. Among the larger crane inquiries expected to close shortly is the list of the Pennsylvania Railroad, eastern region, Philadelphia, Pa., for 33 hand power jib cranes. The Southern Pacific Co., 165 Broadway, New York, has been receiving bids on a 7½-ton hand power crane and the American Locomotive Co. is asking for two 5-ton hand power cranes, one single I beam, the other double I beam, for Schenectady, N. Y. In addition to these, there are the inquiries for 5-ton hand power cranes of the Erie Railroad and the New York Central & Hudson River Railroad. The Pelton Water Wheel Co., San Francisco, Cal., recently closed on a 10-ton, 59-ft. span overhead traveling crane.

Among recent purchases are:

Raritan Foundry Co., Raritan, N. J., a 10-ton, 48-ft. 6-in. span, 3-motor, overhead traveling crane from the Chesapeake Iron Works.

Griffin Mfg. Co., Erie, Pa., two 5-ton and one 10-ton overhead cranes from the Erie Steel Construction Co.

National Tube Co., a 10-ton trolley for its Lorain works, from the Alliance Machine Co.

McClintic-Marshall Co., Pittsburgh, a 40-ton locomotive crane reported to have been purchased from the Industrial Works.

San Antonio & Aransas Pass Railroad Co., Yoakum, Tex., a 15-ton, 54-ft. boom, 8-wheel used Orton & Steinbrenner locomotive crane from Philip T. King, New York.

is the largest amount of business closed by any one dealer the past week.

Small tools continue in good demand, but aggregate sales are not as large as a month ago. The Cushman Chuck Co., Hartford, Conn., reports sales almost identical in volume with those of a year ago and at the same prices. The company's peak business for the year probably was reached in April, when it was about 50 per cent larger than for the corresponding period last year. Since April there has been a gradual recession. It anticipates no change in prices for six months, at least.

Foundations have been completed for a one-story foundry addition to be erected by the H. B. Smith Co., Westfield, Mass., heaters. Monks & Johnson, Boston, are the architects.

Chelsea, Mass., is having plans revised for a three-story, 230 x 232 ft., high school to cost \$700,000, which will contain a machine shop and manual training departments. S. S. Eisenberg, 46 Cornhill, Boston, is the architect.

An architect has not been selected for the one-story, 50 x 70 ft. foundry, cleaning unit, etc., at Milford, Mass., by the William J. Collins Foundry Co., 22 Franklin Street.

The Crompton & Knowles Loom Works, 93 Grand Street, Worcester, Mass., has awarded contract for a two-story, 50 x 170 ft., addition at 241 Harris Avenue.

The United Cape Cod Cranberry Co., South Hanson, Mass., has begun excavations preliminary to the erection of a two-story, 100 x 100 ft. canning and packing house at East Wareham, Mass. Marcus Duran is superintendent.

The Goss & DeLeeuw Machine Co., New Britain, Conn., has purchased the plant of the Buckley Macaroni Co., Kensington, Conn., and will make improvements and install new equipment.

The Warner Hammer Co., Cromwell, Conn., has purchased property on Main Street, which will be improved for manufacturing purposes. The company for years was located in West Cromwell, but was burned out last May. Since then it has been manufacturing in temporary quarters and also in part of the plant of J. & E. Stevens, North Cromwell plant.

The Atwood Machine Co., Stonington, Conn., has awarded a general contract to H. R. Douglas & Son, New London, Conn., for a two-story addition, to be used as a foundry.

Manual training equipment will be installed in the two-story and basement high school to be erected at Barnstable, Mass., estimated to cost \$150,000, for which bids are being asked on a general contract. Charles G. Loring, 7 Water Street, Boston, is architect.

The Hungerford Brass & Copper Co., 296 Franklin Street, Boston, has construction under way on a new two-story works on D Street, South Boston, 80 x 240 ft., estimated to



cost \$120,000. William E. Austin, 46 West Twenty-fourth Street, New York, is architect.

The Standard Oil Co. of New York, 50 Congress Street, Boston, will build a pumping plant in connection with its new storage and distributing works at Sumner's Creek, near Middletown, Conn. A one-story automobile service and repair building will also be erected.

A. Lee Ellis, 10 High Street, Boston, has inquiries out for one centrifugal pump, with capacity of 500 gal. per min., to operate under a 100 ft. head, motor-driven; also for one watertube boiler, Babcock & Wilcox type, 500 hp., using oil fuel, to operate at about 150 lb. working pressure.

A one-story power house will be erected by the Glastonbury Tobacco Warehouse Co., Glastonbury, Conn., in connection with a three-story addition, 80 x 180 ft., estimated to cost \$45,000. Buck & Sheldon, 60 Prospect Street, Hartford, Conn., are architects.

The General Electric Co., Central Falls, R. I., is perfecting arrangements for closing its electric lamp manufacturing plant and will transfer operations to a new works at East Boston, Mass., where considerable increase in production will be arranged.

The Connecticut Tool & Engineering Co., 304 East Washington Avenue, Bridgeport, Conn., has plans for an addition, 40 x 60 ft., with steam power house. Davis & Dane, Bridgeport, are architects.

The Hanson-Whitney Mfg. Co., 169 Bartholomew Avenue, Hartford, Conn., manufacturer of metal-shaping machinery, has awarded a general contract to the R. G. Bent Co., Asylum Street, for a two-story addition, 50 x 86 ft., to cost \$75,000.

Long Brothers, State Street, Hartford, Conn., will commence the erection of a one-story automobile service and repair building, 60 x 242 ft., to cost about \$47,000. A machine shop will be installed. F. C. Walz, Trumbull Street, is architect.

Fire, Oct. 9, destroyed a portion of the plant of the Providence Coal Co., Providence, R. I., including coal pockets, handling machinery, etc., with loss estimated at \$85,000. It will be rebuilt.

New interests, operating as Nesbit & McKinney, have acquired the plant and business of the Otis A. Smith Mfg. Co., Middlefield, Conn., manufacturer of wrenches, pipe nipples and other small hardware. The new owners plan for a reorganization of the company and will expand the plant for a similar line of manufacture.

Fire, Oct. 6, destroyed a portion of the woodworking plants of Griffith Kelver & Co., and the Hatfield Stair Building Co., 118-24 Western Avenue, Brighton, Boston, adjoining properties, with combined loss estimated at \$50,000, including equipment. It is planned to rebuild.

John W. Bolton & Sons, Inc., Lawrence, Mass., is inquiring for a 6-ton flywheel, diameter not over 11 ft. nor under 9 ft., hub not exceeding 14 in. wide, bore not over 10 in. nor under 8 in.

## Pittsburgh

PITTSBURGH, Oct. 15.

THERE continues to be a fair run of individual tool orders, but many dealers and agents still report business as rather slack. Price competition is fairly sharp on passing business, which is said to be due to the fact that many more lines than formerly are sold direct by manufacturers, who can pass on a portion of the saving in commissions. The crane market has shown little life and nothing important recently has come out in mill and power equipment.

The past week has been featured by the distribution of most of the tools inquired for by the Pennsylvania Railroad, Central Region, several weeks ago. Orders placed included two Bridgeford 36-in. lathes, three Newton crank planers, two Newton rod boring machines and six Colburn heavy duty drill presses; six safety wet tool grinders to the Brown & Zortman Machinery Co.; one Fosdick 5-ft. radial drill, through Somers, Fittler & Todd Co.; and one 24-in., three 20-in. and one 18-in. Cisco lathes through the Reliance Machinery Sales Co. A 96-in. boring mill in the original inquiry was abandoned, but there are two 42-in. mills still to be placed. The Pennsylvania Railroad has put out a new list of ten or eleven tools for its car repair shop at Mingo Junction, Ohio. The American Sheet & Tin Plate Co., which some time ago issued a list of about twelve tools, including lathes, shapers, cold saws, keyseaters, and a hammer, is expected to distribute the orders this week.

The Westinghouse Electric International Co. has received orders for electrical apparatus to be used in reconstruction

work in Japan totaling well over \$1,000,000. It is understood that the power plants in the earthquake zone were not seriously damaged, but that the distribution systems were practically destroyed.

The Fawcett Machine Co., Pittsburgh, wants to purchase a 24-in. Gleason automatic bevel gear planer; also a 24-in. internal grinder.

Fire, Oct. 10, destroyed a portion of the forge and blacksmith shop at the plant of the Republic Iron & Steel Co., Youngstown, with loss estimated at \$40,000, including machinery. It is planned to rebuild.

Work has commenced on an addition to the plant of the Chicago Railway Equipment Co., Franklin, Pa., 62 x 122 ft., to be equipped as a brake beam shop. Headquarters of the company are at Forty-sixth Street and Winchester Avenue, Chicago.

Manual training equipment will be installed in the proposed two-story and basement high school to be erected at Bradford, Pa., estimated to cost \$250,000 for which bids will be asked in the near future by Lawrie, Green & Co., Locust Street, Harrisburg, Pa., architects.

The Savage Fire Brick Co., Hyndman, Pa., is planning the construction of an addition to its local plant and the installation of additional equipment. An extension will also be erected at the refractory plant at Williams, Pa. Plans are being arranged for the construction of a new plant at Keystone Junction, near Meyersdale, Pa., to cost \$50,000 with machinery, replacing a former works destroyed by fire a few years ago. It is purposed to develop the three plants to a gross output of 160,000 fire bricks and refractory shapes per day. F. W. Minch is secretary and treasurer.

The New England Fuel & Transportation Co., 111 Devonshire Street, Boston, plans the installation of electric power and coal mining and handling machinery near Arnettsville, Monongalia County, W. Va., where more than 2500 acres will be developed.

C. L. Robinson, Winchester Avenue, Charleston, W. Va., has plans for a new three-story cold storage plant, 100 x 140 ft., estimated to cost \$70,000 with machinery.

The Keystone Driller Co., Eighth Avenue, Beaver Falls, Pa., manufacturer of oil-well machinery, etc., is planning the erection of a one-story foundry addition to cost \$18,000.

The Common Council, Belington, W. Va., is planning to rebuild the portion of its municipal electric power plant recently destroyed by fire, with loss estimated at \$30,000 including equipment.

The Guyan Machine Shops, Logan, W. Va., machinery dealer, has inquiries out for two motors, 100 to 150 hp., and 20 to 30 hp., respectively, each 2200 volts, three phase, 60 cycles; also for one 50-hp. portable boiler, complete with grates, stack and fittings.

The Wolf Summit Coal Co., Clarksburg, W. Va., has tentative plans for the installation of additional electric power equipment and other apparatus at its plant. The company recently increased its capital from \$750,000 to \$1,500,000.

The City Council, McKeesport, Pa., plans the installation of electrically-operated pumping machinery in connection with proposed waterworks extensions and improvements estimated to cost \$233,000.

C. J. Allen, Penn and Center Avenues, Jeanette, Pa., will commence the erection of a two-story and basement automobile service and repair building, 60 x 200 ft., with machine shop, at Mifflin and Denny Streets, Pittsburgh, estimated to cost \$85,000.

The State Board of Control, Charleston, W. Va., has rejected bids for a three-story and basement addition, 70 x 150 ft., to the West Virginia Industrial School for Boys, Pruntytown, W. Va., and will proceed with the work under a day labor plan. It will cost \$100,000 including equipment. R. A. Gillis, Fairmont, W. Va., is architect.

The Continental Coal Co., Fairmont, W. Va., has acquired the properties of the Glasscock Collieries Co., Morgantown, W. Va., for \$325,000, consisting of 500 acres of Sewickley coal lands. The new owner plans development and will install electric power and other equipment. H. W. Showalter is one of the heads of the purchasing company.

The Montgomery-Oldsmobile Co., Montgomery, W. Va., recently organized to represent the Oldsmobile car, has leased a local building, and will install machine shop and other equipment for a service and repair works. R. S. Long, Eagle, W. Va., is president, and John E. Justice, Montgomery, treasurer and general manager.

The Pittsburgh Terminal Railroad & Coal Co., Wabash Building, Pittsburgh, is planning the erection of a new power house. A transmission system will also be built to Horning, W. Va.

Officials of the Edward Hines Lumber Co., 2431 South Lincoln Street, Chicago, operating the Rivesville Coal Co., Rivesville, W. Va., recently acquired, are perfecting plans

for the installation of electric power equipment, hoisting machinery, etc., to increase the capacity of the plant.

The Penn-Overland Co., 713 Railroad Street, Johnstown, Pa., local representative for the Overland automobile, is planning the construction of a three-story and basement service and repair building, 85 x 125 ft., on Central Avenue, to cost \$110,000 with equipment.

## Buffalo

BUFFALO, Oct. 15.

**P**LANs are being prepared by the Acme Road Machinery Co., Frankfort, N. Y., for a new plant at Salem, N. Y., estimated to cost \$180,000 with machinery. E. H. Cook, Frankfort, is architect.

The Dahlstrom Metallic Door Co., Blackstone Avenue and East Second Street, Jamestown, N. Y., has awarded a general contract to Chapman & Graham, Inc., Jamestown, for a two-story addition, 50 x 140 ft., estimated to cost \$50,000.

The Common Council, Sodus, N. Y., plans the installation of electrically-operated pumping machinery in connection with a new waterworks system, estimated to cost \$85,000.

William C. Maltby, 21 Maryland Street, Buffalo, operating a stone works, plans for the installation of a belt-driven air compressor with capacity of about 30 cu. ft.

The Hotel Statler, Inc., Buffalo, has work under way on a new five-story automobile service and repair building, 132 x 181 ft., at 122 Delaware Avenue, estimated to cost \$200,000. A machine shop will be installed.

Pratt & Lambert, Inc., Tonawanda Street, Buffalo, manufacturer of oils, varnishes, etc., has preliminary plans for an addition estimated to cost \$80,000.

E. T. Donovan, Batavia, N. Y., is planning the construction of a new cold storage and refrigerating plant at Elba, N. Y. A list of equipment will soon be arranged.

Power equipment, conveying and other machinery will be installed in the two-story addition to be erected to the plant of the Egloff Bakery, Inc., 147 Genesee Street, Buffalo, estimated to cost \$50,000, for which bids will be called near the end of the year. L. S. Beardsley, 116 West Thirty-ninth Street, New York, is architect.

The Common Council, Hornell, N. Y., is considering the installation of electrically-operated pumping machinery in connection with extensions in the waterworks.

The Hollister Lumber Co., 100 Anderson Avenue, Rochester, N. Y., plans the erection of a two-story addition to its woodworking and lumber mill, 96 x 200 ft., at 320-48 North Goodman Street, to cost \$25,000. Machinery will be electrically operated.

## Detroit

DETROIT, Oct. 15.

**P**LANs have been completed by the Board of County Road Commissioners, Court House, Detroit, for a two-story building, 23 x 185 ft., for the highway department, consisting of a repair shop, automobile service works and office, estimated to cost \$125,000, including equipment.

The Ranney Refrigerator Co., Greenville, Mich., manufacturer of large refrigerating equipment, has commenced the erection of a two-story addition, 80 x 82 ft., and plans to install machinery within the next 60 days.

The Ford Hydro Electric Co., a subsidiary of the Ford Motor Co., Highland Park, Mich., has applied for permission to build a hydroelectric power plant on the Menominee River, Florence County. It is expected to cost close to \$750,000 with machinery.

The Jaxon Steel Products, Inc., Jackson, Mich., a division of the General Motors Corporation, will build an addition to its plant on South Horton Street, estimated to cost \$32,000.

The Acme Red Cedar Chest Co., Niles, Mich., is contemplating the erection of an addition to its local plant. It will also enlarge its factory at Chattanooga, Tenn., and install additional machinery. It is purposed to develop an annual output of 35,000 chests at the two plants.

The Lincoln Automobile Co., Detroit, has extension work under way at its plant on West Warren Street, and will remove equipment to the new building recently completed. Considerable additional machinery will be installed, as well as conveying, hoisting and kindred material-handling apparatus.

Adolph H. Brandt, 639 Plymouth Road, Grand Rapids, Mich., is organizing a company to build a seven-story automobile service and repair building, with complete machine shop and parts department, to cost close to \$45,000, including equipment.

The Dollar Bay Lumber Co., Dollar Bay, Mich., is planning for extensions in its plant, to include a new power house and the removal of the machine shop to another location for enlargements.

The Continental Can Co., 61 Broadway, New York, is planning the installation of improved machinery at its Detroit works to manufacture cans and tubes, comprising former departments of the National Can Co., recently purchased, and constituting about 60 per cent of the holdings of this company. The new plant on East Grand Boulevard will be operated as a unit of the Continental company, with considerably enlarged capacity.

The Belding-Hall Refrigerator Co., Belding, Mich., is planning to double its capacity with the two-story addition, upon which work has been commenced, and will install new equipment as soon as the structure is ready.

Manual training equipment will be installed in the two-story high school to be erected at Jonesville, Mich., estimated to cost \$100,000, for which bids will be asked on a general contract early in November. Ernest S. Batterson, Hanselman Building, Kalamazoo, Mich., is architect.

## Baltimore

BALTIMORE, Oct. 15.

**P**LANs are being drawn by the Bureau of Yards and Docks, Navy Department, Washington, for electrical equipment for the Pearl Harbor, H. T., Navy Yard, including motor-generator, switchboard, transformers, sub-station equipment and auxiliary machinery, specification 4924, superseding specification 4548. Bids will be received by the bureau until Nov. 14, for fuel oil storage equipment for the Mare Island Navy Yard, specification 4717.

The Porcelain Enamel & Mfg. Co., Baltimore, has awarded contract to the P. C. Street Engineering Co., 406 St. Paul Street, for a one and two-story plant, 100 x 510 ft., at its new works at Eastern Avenue and Twenty-third Street, to cost about \$250,000 including machinery. An office building will also be built to cost \$50,000. R. C. Sandlass, Main Avenue, is architect. Heinrich Turk is president.

The Pocahontas Coal & Land Corporation, Graham, Va., is planning for the installation of tipple machinery, hoisting, conveying and other equipment at its properties. C. L. Shuffelburg is one of the heads of the company.

R. P. Johnson, Wytheville, Va., machinery dealer is inquiring for a 50 hp. vertical boiler, complete with fittings and auxiliary equipment.

P. T. Etheridge, Empire, Ga., is in the market for equipment for a rock-crushing plant for cement mill service.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Oct. 30 for copper and iron wire cloth for the Hampton Roads, Vt., Navy Yard, schedule 1425, until Nov. 6, for Eastern and Western Yards, a quantity of steel strands and wire rope, schedule 1435.

David H. Kirkland, Raymond, Ga., is organizing a company to build a plant for the manufacture of fire brick, pipe and kindred products, estimated to cost \$65,000. Inquiries will be made for machinery at once.

D. R. Perego, R. F. D. No. 2, Ashland, Va., operating a sheet metal works, is planning the installation of additional tools and equipment, including a cornice brake.

The Danville Ice Co., Danville, Va., is planning for the installation of additional power equipment at its Southside plant, including oil-operated engine and auxiliary apparatus, estimated to cost \$45,000.

The Industrial Machinery Division, Room 815, Bureau of Foreign and Domestic Commerce, Washington, will receive catalogs and price lists of sugar machinery for forwarding to the American trade commissioner at Johannesburg, South Africa.

Bids will be received by the Chief of Air Service, United States Army, 1050 Munitions Building, Washington, until Oct. 23, for standard airplane utility parts, including bolts, rivets, nails, screws, etc., circular 24-30, until Oct. 22, for hangar material, including 18,000 bolts, 25,000 hook bolts, 16,000 U-bolts, tie and splice plates, etc., circular CAS 24-33.

J. M. Handley, La Grange, Ga., has inquiries out for a power cane mill and auxiliary equipment.

The Murphy Coal & Iron Co., Murphy, N. C., recently organized, is in the market for equipment for a local plant, including steam shovels, ore washing machinery, crushing equipment, drilling equipment and miscellaneous apparatus for the production of iron ore. Scott Litton is president; L. L. Heaton is general manager.

The Community Refrigerating Co., P. O. Box 27, Burlington, N. C., is planning to purchase equipment for a local



ice-manufacturing and refrigerating plant. Second-hand equipment, in good condition, will be considered.

The Erwin Cotton Mills, Inc., Duke, N. C., will install electric power equipment at its plant in connection with additions to cost close to \$2,000,000. The present No. 2 mill will be electrified and all steam-driven equipment replaced.

The Atlantic Coast Line Railway Co., Wilmington, N. C., is taking bids on a general contract until Oct. 24 for its two new car shops at Rocky Mount, N. C., each 100 x 320 ft., and smaller structures. The works will cost \$100,000 with equipment. J. E. Willoughby is chief engineer.

The Bureau of Foreign and Domestic Commerce, Washington, has received an inquiry from Adelaide, Australia, for railroad machine shop and work shop machinery, No. 7887; from Bilbao, Spain, for machinery for the manufacture of wire products, No. 7932.

The Common Council, Sylvester, Ga., is planning the installation of centrifugal pumping machinery, air compressor and other equipment at the municipal waterworks, pumps to be of capacity from 500 to 1000 gal. per min.

The Steel Heddle Mfg. Co., Allegheny Avenue and Twenty-third Street, Philadelphia, has awarded a general contract to W. W. Welch, Greenville, S. C., for its new two-story branch plant on East McBee Street, Greenville, to cost \$75,000. J. E. Sirrine & Co., Greenville, are architects and engineers.

A power house will be installed at the new three-story laundry to be erected by Archers Laundry, Howard and Mulberry Streets, Baltimore, for which foundations will be laid at once, estimated to cost \$185,000 with equipment. J. K. Stack, Baltimore, is architect.

The Asheville Power & Light Co., Asheville, N. C., is planning for extensions and improvements to cost about \$200,000, including the installation of additional machinery. C. S. Walters is vice-president and general manager.

The Hackley Morrison Co., Inc., 1708 Lewis Street, Richmond, Va., machinery dealer, has inquiries out for a coal elevator for unloading cars, with gasoline engine; also, for one 225 kva. electric alternator, belted type, with exciter, switchboard, pulley and auxiliary equipment; one 30-hp., two 20-hp., two 15-hp., two 10-hp., ten 5-hp. and one 2-hp. electric motors, all three-phase, 60 cycle, a. c.; one boiler feed pump, 12 x 7 x 12 in., Burnham type; two steam vacuum pumps, simplex or duplex; one gasoline air compressor, mounted on a 4-wheel truck, about 150 cu. ft. capacity; one portable boiler, 25-hp., mounted on skids or wheels; one hot water storage heater, and two locomotive type boilers, about 50-hp., 100 lb. working pressure.

The Jones Motor Car Co., Richmond, Va., has awarded a general contract to E. L. Bass & Brothers, Richmond, for a two-story service and repair building, 85 x 120 ft., estimated to cost \$80,000. Henry T. Barnham, Richmond, is architect and engineer.

Walter Clark, P. O. Box, 824, Wilmington, N. C., has inquiries out for a steam shovel, about 1/4-yd. capacity.

The Common Council, Staunton, Va., plans the installation of electrically-operated pumping machinery in connection with extensions in the municipal waterworks, estimated to cost \$500,000.

The Oxford Buggy Co., Oxford, N. C., desires to secure information about the machinery required to manufacture tags, signs, etc., of sheet steel, tin or other such metal, covering processes, cost of installing machines and the like. The question of dies is also to be covered. The company would like information also about painting and baking, and the incidental ovens. The company has its own building. If it goes into this branch of manufacture it would need only machinery and equipment.

## Cincinnati

CINCINNATI, Oct. 15.

**I**NQUIRIES continue generally to run to one and two machines, with no particular branch of industry predominating, although automobile manufacturers have placed most of the larger orders booked for the past few months. Nothing further has developed on the inquiry for lathes received from Japan and no action is expected for a few weeks at least.

One of the largest orders for machine tools placed this year was distributed among manufacturers in different parts of the country during the past 10 days by the Willy-Morrow Co., Elmira, N. Y. Purchases amounted to over \$600,000 and included milling machines, gear hobbors, gear shapers, broaching machines and various automatic machines. It is reported that one Eastern manufacturer alone received an order totalling over \$300,000. Outside of this,

improvement is noted generally in the machinery market, though no very large orders have been placed. The Maxwell Motor Car Co. is reported to have placed an order for a number of machines for its Newcastle, Ind., plant, and is expected to buy others. The Chicago, Burlington & Quincy Railroad is reported to have advised that it will place orders for lathes during the week, and action is also expected on the list of the Pennsylvania Lines, Central and Western regions.

The Dayton Fire Door Co., Dayton, Ohio, has been incorporated with a capitalization of \$15,000. It has been operating as a partnership. Walter F. Geis is president.

The Norris Mfg. Co., Columbus, Ohio, manufacturer of vending machines, has awarded contract for a factory building which will enable it to practically double its capacity. George Norris is president.

The branch plant at Nashville, Tenn., of the Turner, Day & Woolworth Handle Co., Louisville, Ky., was practically destroyed by fire Oct. 5, involving a loss of approximately \$150,000. It will be rebuilt.

The plant of the Western Drop Forge Co., Marion, Ind., recently put into the hands of a receiver, will be sold at auction Oct. 22. It is reported that the plant will be bid in by a large motor manufacturer. Phillip Matter, Marion, is receiver.

## Cleveland

CLEVELAND, Oct. 15.

**L**OCALLY the market has become somewhat more active in small lots of machines. The White Motor Co. is inquiring for several tools. The Lima Locomotive Corporation, Lima, Ohio, has an inquiry out for a 60-in. motor-driven vertical boring and turning mill with two heads. One Cleveland manufacturer purchased 5 screw machines.

The Japanese Government has placed an order for 8 automatic screw machines with a Cleveland manufacturer for reequipping one of its arsenals, and other live Japanese inquiries are pending.

Detroit automobile companies continue to buy equipment in good volume. The Ford Motor Co. during the week placed a \$400,000 order for special production lathes with an Eastern machine tool manufacturer and virtually closed on a round lot of grinders. It is understood to have a great deal of additional equipment still to place. According to reported plans, the Ford company, which has been a heavy buyer of machinery the last few weeks, will add 25 per cent. to its equipment, which will result in close to a 50 per cent. increase in capacity and increase its output from 7000 to 10,000 cars per day. Considerable business in tool room equipment is now pending from the Ford company. Another Detroit automobile manufacturer during the week issued requisitions for 35 standard machine tools aggregating \$80,000 and has placed orders for several of these. Following this company's policy of buying, orders for the remainder will be spread over the next few weeks. Some orders for small lots of machines up to a half dozen tools were placed by the Chevrolet and Buick companies and by the Canadian Products Co., Walkersville, Ont., a subsidiary of the General Motors Corporation. The Michigan Screw Co., Detroit, purchased three large grinding machines.

The Taplin-Rice Clerkin Co., Akron, Ohio, has commenced the erection of a foundry to replace one recently burned. The estimated cost is \$125,000.

The Eaton Axle & Spring Co., Cleveland, which has had plans for a \$90,000 factory extension, has taken no definite steps toward the erection of this building and the placing of contracts may be postponed.

The Donley Brothers Co., Cleveland, manufacturer of iron and steel specialties, has completed a new one-story factory, 100 x 163 ft., at 139th and Merrill Streets.

The Cleveland Refrigerator Co., 6600 Sideway Avenue, Cleveland, has commenced the erection of a one-story extension 88 x 124 ft. Some new equipment will probably be required.

The Anderson Body Co., Sidney, Ohio, has been incorporated with a capital stock of \$150,000, and has taken over the plant of the Sidney Mfg. Co., and will manufacture bus and hearse bodies and closed bodies for automobiles.

The J. Van Nette & Sons' Lawn Mower Co., Tiffin, Ohio, has been organized and will equip the plant for the manufacture of lawn mowers.

Plans are under way for the reorganization of the Gramm-Bernstein Motor Truck Co., Lima, Ohio, which is being operated under receivership. Authority has been given by the Federal Court to sell the plant and members of the former organization are working on the financing plans.

The Anderson Rolled Gear Co., Lakewood, Ohio, is inquiring for a Brown & Sharpe No. 13 heavy gear cutter, with indexing head and mechanism in good condition.

The Columbia-Elyria Power Co., Elyria, Ohio, recently organized by the officials of the Elyria Iron & Steel Co. and the Columbia Steel Co. as a joint subsidiary, is planning for the construction of a new power plant to furnish service at the two steel works. H. B. Wicks is president.

The Gabriel Mfg. Co., 1407 East Fortieth Street, Cleveland, manufacturer of automobile shock absorbers, has awarded a general contract to the A. A. Lane Construction Co., 1869 East Fifty-fifth Street, for a two-story and basement addition, 80 x 125 ft., to cost approximately \$80,000. Claude H. Foster is general manager.

The Baltimore & Ohio Railroad Co., Baltimore, is planning the erection of a new eight-story ice and cold storage plant at Toledo, Ohio, estimated to cost \$2,500,000, with machinery.

The Colonial Insulator Co., 973 Grant Avenue, Akron, Ohio, is planning the erection of a one-story addition, 30 x 150 ft. G. Ball, Room 616, Metropolitan Building, is architect.

## Philadelphia

PHILADELPHIA, Oct. 15.

**T**ENTATIVE plans are being considered by E. I. du Pont de Nemours & Co., Wilmington, Del., for a new linseed oil manufacturing plant in the vicinity of its Harrison paint plant, Thirty-fifth Street and the Grays Ferry Road, Philadelphia, to cost \$200,000 with machinery.

C. M. Roswell, 1162 Marlyn Road, Philadelphia, machinery dealer, has inquiries out for one rotary converter, 500 kw., railroad type, with or without transformer and switchboard, also for one air compressor, 2000 cu. ft. capacity, 100 lb. pressure, motor-driven, second-hand, in good condition.

The Philadelphia Taxi Corporation, Walnut and Twenty-second Streets, Philadelphia, has leased the one-story building at Oxford, Turner and Twentieth Streets, for the establishment of a new service and machine repair, and storage works.

The Campbell Construction Co., 910 North Front Street, Philadelphia, is planning to purchase a disk sander for planing mill service. S. Campbell is in charge.

George W. Smith & Co., Inc., Philadelphia, operating a woodworking plant at Forty-ninth and Botanic Streets, has awarded a general contract to the John N. Gill Construction Co. for a new plant, 210 x 370 ft., for assembling and other service, estimated to cost \$200,000 with machinery.

The Remington-Burnell Aircraft Corporation, 25 West Forty-fifth Street, New York, has purchased 4 acres on Magazine Lane, Philadelphia, as a site for a new plant to manufacture commercial aeroplanes and parts, for which plans are now being drawn. A portion of the works will also be given over to the production of bombing planes. The initial plant will cost more than \$80,000 with machinery. The company formerly operated works at Amityville, L. I.

The Pennsylvania Railroad Co., Broad Street Station, Philadelphia, will commence the electrification of its Fort Washington branch for a distance of about 6 miles, with the installation of power equipment, electric feeder system, lines, etc. Bids are also being taken for a new tool house on Kensington Avenue.

The York Machinery & Supply Co., York, Pa., is in the market for a 10-ft. used power brake for No. 10 gage material.

Charles Boyle, Philadelphia, has awarded a general contract to the Smith-Hardican Co., 1809 Cherry Street, for a new automobile service and repair building at 4642-46 Baltimore Street, with machine shop, to cost about \$60,000.

Manual training equipment will be installed in the three-story boys' high school to be erected on Hunting Park Avenue by the Catholic Archdiocese of Philadelphia, to cost more than \$500,000, for which plans are being prepared by the Hoffman-Henon Co., Finance Building, architects.

The Common Council, Shenandoah, Pa., is planning the installation of electrically-operated pumping machinery in connection with proposed extensions in the municipal water-works, estimated to cost \$200,000.

Power equipment, ovens, conveying and other machinery will be installed by the Norristown Baking Co., Norristown, Pa., in its addition estimated to cost \$47,000, including improvements in the present plant. J. B. Chamberlain, Markle Building, Hazletown, Pa., is architect.

The Pennsylvania Power & Light Co., Allentown, Pa., is disposing of a bond issue of \$4,000,000, the majority of the proceeds to be used for extensions in power plants and system. The company is organizing a subsidiary, the Telford Power & Light Co., to install a system at Telford, Pa., and vicinity. P. B. Sawyer is vice-president.

A one-story power house will be constructed by the Confederated Home Abattoir Co., American Casualty Building, Reading, Pa., at its proposed new plant at Nazareth, Pa., estimated to cost \$65,000. The Gorman-Brown Engineering Co., 40 Rector Street, New York, is engineer.

Manual training equipment will be installed in the new high school to be constructed at Palmerton, Pa., estimated to cost \$300,000, for which bids will be received on a general contract on Nov. 1. W. H. Lee, 1505 Race Street, Philadelphia, is architect.

The Watts Water & Power Co., and the Juniata Water Power Co., Juniata, Pa., recently organized, are perfecting plans for a hydroelectric power station development in the vicinity of Iroquois, Pa., on the Juniata River, where a large dam will be constructed. It will cost more than \$450,000.

C. T. Helms, Oseola Mills, Pa., will install a machine shop in his proposed two-story automobile service building, estimated to cost \$40,000, for which plans are being prepared by A. W. Rudolph, Masonic Building, Altoona, Pa., architect.

Manual training equipment will be installed in the new two-story senior and junior high school to be erected in the West Side district, Norristown, Pa., estimated to cost \$500,000, for which bids will be received on a general contract until Oct. 30. Oliver Randolph Perry, 1524 Sansom Street, Philadelphia, is architect.

The Replier Coal Co., Mount Carmel, Pa., is considering the installation of electric power and mining machinery at the properties of the Dark Water Colliery, near St. Clair, Pa., recently acquired.

The Boyertown Burial Casket Co., Boyertown, Pa., has construction in progress on an addition and will soon commence the installation of machinery, including steam power and other equipment.

Leonard Hengel, Lancaster Pike, Haverford, Pa., will install a machine and repair shop in his two-story automobile service building, 100 x 133 ft., for which bids will soon be taken by Charles Norton, 29 West Lancaster Avenue, Ardmore, Pa., architect.

The E. B. Leaf Co., Real Estate Trust Building, Philadelphia, is inquiring for clean, straight, full-length, used 4-in. tubes.

## Chicago

CHICAGO, Oct. 15.

**B**OTH sales and inquiries are scattered, but on the whole, the market appears to be somewhat more active. The Public Service Co. of Northern Illinois, has concluded purchases amounting to about \$25,000 for its Waukegan, Ill., power plant. The Pettibone-Mulliken Co., Chicago, has taken figures on 26 machine tools as listed below. The Illinois Central has issued inquiries for a 75-ton vertical motor-driven hydraulic press, a car wheel lathe, and a flue cutter. No action has yet been taken on the extensive Burlington list. From Detroit comes word that the Ford Motor Co. is purchasing considerable additional equipment, with a view to increasing its production to 10,000 cars a day. A considerable proportion of current orders and inquiries calls for used machines. Carr Brothers, Inc., 65 Broadway, New York, advises that one of its clients is in the market for a considerable amount of second-hand machinery, which, however, must be absolutely modern, not old, out-of-date, or worn out. Included in this list are 44 miscellaneous machine tools, 4 pneumatic hoists, and 21 wood-working machines.

### Pettibone-Mulliken Co. List:

One motor-driven keyseating machine to cut up to 2 in. wide keyseats.

One motor-driven  $\frac{3}{4}$ -in. keyseater.

Three motor-driven 18-in. x 10-ft. engine lathes.

One motor-driven 4-in. two-spindle centering machine.

Three motor-driven No. 2 universal cutter and tool grinders.

Two automatic planer-type surface grinders, capacity about 24 in. x 18 in. x 4 ft.

One No. 1 or No. 2 universal motor-driven milling machine.

One motor-driven 72-in. frog and switch planer.

One motor-driven 42-in. x 42-in. x 16-ft. planer.

Two motor-driven horizontal boring, drilling and milling machines with  $2\frac{1}{2}$  or 3-in. bar.

Two  $3\frac{1}{2}$ -ft. motor-driven radial drills.

One motor-driven 24-in. x 16-ft. heavy pattern engine lathe.

Two 6-ft. motor-driven radial drills.

Three 28-in. motor-driven shapers.

Two 18-in. x 14-ft. motor-driven heavy pattern engine lathes.



The Missouri Pacific has ordered a 200-ton locomotive hoist from the Whiting Corporation.

A. N. Day, with headquarters at present at the Blackstone Hotel, Chicago, is in the United States for the purpose of purchasing machine tools and equipment for a new railroad shop of the South Australian Railways.

The Ero Mfg. Co., producer of automobile accessories, previously located at 753 West Jackson Boulevard, Chicago, has leased a four-story building, 100 x 100 ft., at 2240 Ogden Avenue.

The Gary Motor Truck Co., Gary, Ind., is preparing to double its capacity, which will make its annual output approximately 3000 cars.

The Mulvey Iron Works, 1840 Carrol Avenue, Chicago, will construct a one-story plant, 66 x 200 ft., 328 North California Avenue, to cost \$16,000.

The United Auto Register Co., 2316 West Forty-third Street, Chicago, has awarded a contract to E. W. Sproul, 2001 West Pershing Road, for a one-story factory, 77 x 80 ft., 2316-40 West Forty-third Street, to cost \$18,000.

The Sioux Falls Machine Works, Sioux Falls, S. D., will erect a two-story addition.

The Norris Brothers Machine Shop, Robinson, Ill., is building an addition, 30 x 60 ft.

The Barber-Greene Co., manufacturer of belt and portable conveyors, Aurora, Ill., will erect two additions, one 24 x 45 ft., to cost \$3,000, and the other 130 x 175 ft., to cost \$26,500.

The Remy Electric Co., Anderson, Ind., has started the construction of a one-story addition, containing 12,500 sq. ft. of floor space, to cost \$25,000.

The Graham Brothers Truck Co., Evansville, Ind., has completed plant unit No. 3, and has started the construction of unit No. 6, which will be 90 x 250 ft., and will cost \$60,000.

Manual training equipment will be installed in the new two-story high school to be erected at Waseca, Minn., estimated to cost \$450,000, for which bids are being asked on a general contract until Oct. 30. William B. Ittner, Board of Education Building, St. Louis, is architect.

The American Radiator Co., 816 South Michigan Avenue, Chicago, has tentative plans for the construction of an additional unit at its new plant at St. Paul, Minn., recently established, to cost about \$250,000, including machinery.

The State Board of Charities and Reform, Cheyenne, Wyo., is planning the construction of a power plant at the State Hospital, Evanston, Wyo., to cost \$50,000.

Manual training equipment will be installed in the new junior high school to be erected at Beatrice, Neb., estimated to cost \$150,000. The J. H. Felt Co., Kansas City, Mo., is architect.

The Public Service Co. of Colorado, Denver, is disposing of a bond issue of \$5,000,000, a portion of the proceeds to be used for extensions in power plants and system.

The Common Council, Walthill, Neb., is arranging for a bond issue of \$46,000, for the construction of a municipal electric light and power plant, and ice plant. The Prince-Nixon Engineering Co., 501 Peters Trust Building, Omaha, Neb., is engineer.

The S. & H. Motor Co., 203 Hacker Avenue, Joliet, Ill., is planning the construction of a three-story automobile service and repair building, 100 x 150 ft., estimated to cost \$65,000. A. M. Selby heads the company.

A. A. Fasig, Anna, Ill., is organizing a company to erect and operate a cement manufacturing plant, with initial output of about 80,000 bbl. per month, estimated to cost \$60,000 with machinery. A power house will be built.

The Polar Wave Ice & Fuel Co., 3625 Olive Street, St. Louis, is perfecting plans for a new ice-manufacturing and cold storage plant at Decatur, Ill., estimated to cost \$175,000 including machinery.

## Indiana

INDIANAPOLIS, Oct. 15.

**ARRANGEMENTS** are being made by the Fraggate Mfg. Co., F. W. Fraggate, president, Centralia, Ill., for the establishment of a new plant in the Charles Hartmetz Building, Evansville, Ind., recently leased for the manufacture of computing scales and precision equipment. Machinery will be installed immediately.

Bids will be received by the Quartermaster Department, United States Army, Jeffersonville, Ind., until Oct. 22 for one exhaust fan, one rotating type sand blast barrel and one electric spot welding machine, circular 24-32.

Thomas L. Green & Co., 202 Miley Avenue, Indianapolis, manufacturer of bakers' machinery, will take bids at once for a one-story addition, 90 x 120 ft., to cost \$37,000. A

traveling crane, 5 to 7 tons capacity, will be installed. Charles E. Bacon, 605 Odd Fellows Building, is architect.

The Indiana Oil Refining Co., Columbus, Ind., is planning for a fund of \$125,000 to purchase additional equipment for its local refinery. The Graver Corporation, East Chicago, Ind., is interested in the company.

The plant and property of the Arvac Mfg. Co., Anderson, Ind., manufacturer of universal joints, etc., will be offered at public sale on Oct. 23, including power plant, cranes, hoists, etc.

The Terre Haute, Indianapolis & Eastern Traction Co., Indianapolis, is having plans prepared for new car barns and shop at Richmond, Ind., to cost about \$50,000.

The Victor Plaston Pin Co., Indianapolis, recently organized, will establish a plant at 115 North Noble Street for the manufacture of piston pins and other automotive products.

The Bucyrus Co., Evansville, Ind., manufacturer of dredging machinery, etc., has preliminary plans for an addition to provide for an increase of about 40 per cent in output. It is expected to commence work early in 1924. Headquarters of the company are at South Milwaukee, Wis.

The Columbus Machine Works, Columbus, Ind., manufacturer of pipe-working machinery, has commenced the removal of a portion of its plant to the new location at Crothersville, Ind., recently selected, and purposes to operate at the latter place under considerable increased capacity at an early date. A portion of the works will be retained at Columbus for a number of weeks to come, and later will be consolidated at the Crothersville plant, with additional equipment.

The New York, Chicago & St. Louis Railroad Co., Cleveland, has completed negotiations for the purchase of a tract of land adjoining its shops at Frankfort, Ind., for a consideration of \$12,000, and will have plans drawn at once for the construction of an addition, to include a new engine house, repair shop and other structures.

Fire, Oct. 5, destroyed a portion of the plant of the Honeywell Heating & Specialty Co., Wabash, Ind., manufacturer of radiator valves and heating equipment, with loss estimated at \$50,000. It is planned to rebuild.

The Leonard Tractor Co., Gary, Ind., is said to be planning for the installation of a planer and other tools in its machine department.

A portion of the power house and canning factory of Frazier & Norris, Hobbs, near Tipton, Ind., were destroyed by fire, Oct. 4, with loss estimated at \$60,000, including equipment.

The United States Shingle Co., Wabash, Ind., manufacturer of asbestos shingles, is negotiating for the purchase of the local plant of the Wabash Tractor Co., now occupied under lease, and plans for extensions and improvements for increased output.

The Interstate Public Service Co., Indianapolis, is perfecting arrangements for the purchase of the plant and property of the Jeffersonville Water, Light & Power Co., Jeffersonville, Ind., for a price of \$165,000. Extensions will be made, with additional equipment, for increased capacity.

## Milwaukee

MILWAUKEE, Oct. 15.

**M**ACHINE-TOOL orders come rather after the fashion of a trickle than a steady stream. A moderate volume is represented by scattering demands, most of which are predicated upon strict necessities. On the whole, however, sales for the first half of October show an improvement over the corresponding period in September, yet in most instances demand is below that of the same time a year ago. Employment officials speak of a shortage of machinists and helpers, and of heavy-duty labor for foundries, although the lack of men is less pronounced than during the summer months. The agricultural implement situation is showing steady improvement. John Deere interests of Moline reopened the Van Brunt shops at Horicon, Wis., on Oct. 8, after a long period of low-capacity operations. The most active winter in at least three years is indicated by orders on the books of farm machinery manufacturers in Wisconsin.

The A. O. Smith Corporation, Milwaukee, manufacturer of pressed steel automobile frames, forgings, etc., is continuing its enlargement program and is steadily in the market for additional miscellaneous equipment. James L. Sinyard is secretary.

The United States Engineer Office, Federal Building, Milwaukee, will close bids Oct. 30, for furnishing complete

a 1000-ton steel barge, 172 ft. long, with 40 ft. beam, equipped with a steel swivel derrick with a radius of 65 ft., for the Milwaukee and Grand Haven, Mich., harbor projects. The cost is estimated at from \$80,000 to \$100,000.

The Schalmir Products Co., Milwaukee, identified with the Claybourn Process Corporation, manufacturer of multi-color printing presses, will erect a one-story brick and concrete manufacturing building, 110 x 141 ft., adjoining the Claybourn shops. The work is in charge of Herman J. Esser, architect and engineer, 82 Wisconsin Street, Milwaukee.

The Berg Supply Co., Marshfield, Wis., has purchased the plant, machinery and stock of the Mullins Mfg. Co., Brillion, Wis., manufacturer of steel stanchions, water cups and mangers, and is consolidating with its Marshfield plant, which has recently been enlarged by a new building. Some additional machinery will be purchased soon. Grube Berg is works manager.

The Common Council of Hurley, Wis., is asking bids until Oct. 28 for the complete construction and equipment of a pumping station and water purification plant at Lake Lavina, estimated to cost \$37,000. J. H. A. Brahtz, 409 Metropolitan Building, St. Paul, Minn., is consulting engineer in charge of the project. John Emunson is city clerk.

The Harry E. Weber Co., 582-584 Jefferson Street, Milwaukee, operating the Stewart-Warner Products Service Station, will build a \$100,000 store, warehouse and shop building, 120 x 128 ft., at Martin and Van Buren Streets. Plans are being drawn by Van Ryn & DeGelleke, architects, 114 Grand Avenue, and will be ready about Dec. 1. Harry E. Weber is president and general manager.

The Madison Nash Co., 155 East Wilson Street, Madison, Wis., has plans by Claude & Starck, local architects, for a \$65,000 garage and service building, 75 x 155 ft., part two and three stories. Work will commence immediately and completion is planned for March 1. Equipment will be purchased after Jan. 1. Ray A. Dillon is president and general manager.

The John E. Boettcher Mfg. Co., Madison, Wis., has been incorporated with a capital stock of \$50,000 to manufacture dairy devices, liquid measures, scales and other equipment. A small shop is being established at Waunakee, near Madison. The principals are John E. Boettcher and Henry G. Town, both of Madison.

The Kenosha Fruit Co., 452 Pearl Street, Kenosha, Wis., has let the general contract to Bondgard & Christensen, 1135 Mound Avenue, Racine, Wis., for the construction of a \$75,000 cold storage warehouse, 60 x 130 ft., two stories and basement, and is buying engine, boilers, generators, refrigerating unit and other equipment. Frank Luxum and Jens Jensen are the proprietors.

The Concrete Specialty Mfg. Co., Milwaukee, has awarded contracts for a \$50,000 shop addition, 110 x 132 ft., at Holton and Lake Streets, designed by C. H. Tharinger and John P. Bruecker, associated architects, 496 Cramer Street. Mixing and molding machinery, electric motors, conveyors, racks, etc., will be required.

The Milwaukee Electric Railway & Light Co., Public Service Building, will build a \$50,000 garage and service building for its subsidiary, the Wisconsin Motor Bus Lines, as an addition to its main car construction and repair shops at Fortieth Street and Cold Spring Avenue. Fred M. Luber is chief architect.

John M. Chapple & Co., Ashland, Wis., proprietors of the Ashland *Daily Press*, has plans by Henry Fuller, architect, for a two-story brick and concrete publishing building, 64 x 120 ft., which with new equipment will represent an investment of \$75,000.

## The Gulf States

BIRMINGHAM, Oct. 15.

**T**ENTATIVE plans are under consideration by the Gadsden Car Works, Gadsden, Ala., for rebuilding the portion of its erecting department destroyed by fire Oct. 11 with loss estimated at \$250,000, including equipment. The company is affiliated with the Southern Railway Co.

The Common Council, Lake Worth, Fla., is perfecting plans for an addition to the local municipal electric power plant to cost \$40,000, for which bonds have been authorized.

The Allen-Oden Mining Co., P. O. Box 984, Birmingham, has inquiries out for a jaw crusher and auxiliary equipment.

The Ampco Iron Co., Springfield, Mo., has preliminary plans for the establishment of branch works in the vicinity of El Paso, Tex., for the production of iron and steel products estimated to cost \$40,000.

The United States Export Chemical Corporation, Tampa, Fla., recently organized, is perfecting plans for the initial unit of its new plant for the production of super-phosphates

for fertilizer manufacture. A power house will be constructed. The plant will cost in excess of \$300,000 with machinery. Lorenzo A. Wilson, president Wilson & Toomer Fertilizer Co., Jacksonville, Fla., is one of the heads of the company; Harry A. Pierce is vice-president.

The City Council, Shreveport, La., will install electrically-operated pumping machinery in connection with a new water works system, for which bonds for \$1,000,000 have been voted. The pumping plant will cost about \$200,000. The J. N. Chester Engineers, Union Bank Building, Pittsburgh, are engineers.

The Mine & Mill Supply Co., Tampa, Fla., is arranging for the erection of a new plant on West Lemon Street, Lakeland, Fla., where it purposes to establish its main works and headquarters. The company recently increased its capital from \$100,000 to \$200,000 for expansion.

The City Commission, Jacksonville, Fla., has disposed of a bond issue of \$850,000, the proceeds to be used for the municipal electric plant and system.

The Ford Motor Co., Highland Park, Mich., has acquired about 9 acres on the St. Johns River, Jacksonville, Fla., for a new assembling and distributing plant, with initial unit estimated to cost \$225,000 with equipment.

The Waggoner Ranch Corporation, Vernon, Tex., recently formed with a capital of \$10,000,000, is planning the construction of an electric light and power station for general commercial service in connection with the development of a portion of its lands. It will cost in excess of \$50,000. W. T. and Guy Waggoner head the company.

The Standard Sanitary Mfg. Co., Bessemer Building, Pittsburgh, is planning the erection of a four-story factory branch at Houston, Tex., estimated to cost \$160,000.

The American Metal Co., Amarillo, Tex., care of the local Chamber of Commerce, has preliminary plans for the erection of new works for the production of zinc and other metal products, to cost \$500,000, including equipment. The New Jersey Zinc Co., Palmerton, Pa., is said to be interested in the project.

The Houston Railway Car Co., Interurban Viaduct and Calhoun Avenue, Houston, Tex., is in the market for galvanizing equipment and machinery to be used in manufacturing refrigerator car brine tanks.

Halwell & McQueen, Birmingham, operating a general machine and welding works, are considering the establishment of a branch plant at Selma, Ala.

The Common Council, Celina, Tex., plans the installation of electrically-operated pumping machinery in connection with extensions in the municipal water works to cost about \$65,000.

The Southern Pacific Railroad Co., El Paso, Tex., has work in progress on an extension program at its car and locomotive shops in different parts of the State to cost more than \$400,000 with equipment.

The Texas Steel Mills, Inc., Fort Worth, Tex., is perfecting plans for an addition on South Hemphill Street, estimated to cost \$75,000, including equipment.

W. E. Gaither, Rockdale, Tex., is planning the erection of a three-story automobile service and repair building on property recently acquired to cost \$65,000.

## The Central South

ST. LOUIS, Oct. 15.

**A**BOND issue of \$2,265,000 has been arranged by the Kentucky Utilities Co., Lexington, Ky., operating electric light and power plants and systems, a portion of the proceeds to be used for extensions.

The Eugene Straus Cabinet Co., 1029 Hamilton Avenue, Louisville, has commenced the erection of a new two-story plant on Baxter Avenue, estimated to cost \$200,000 with machinery. Eugene Straus is president.

The Sheehan Aviation Field, Inc., Frank Sheehan, president, Owensboro, Ky., is planning the construction of an airplane repair and parts plant at its new aviation field, with hangars, etc., on 25-acre tract recently acquired.

The Kaw Valley Drainage District, 719 Osage Street, Kansas City, Kan., J. A. Shine, secretary, is planning the installation of 20 electrically-operated pumping units in connection with property improvements, estimated to cost \$190,000.

Bids will soon be asked by the Ford Motor Co., Highland Park, Mich., for a one-story and basement addition, 200 x 875 ft., to its assembling plant on Winchester Avenue, Kansas City, Mo., to cost \$300,000. Albert Kahn, 1000 Marquette Building, Detroit, is architect.

The M. S. Cohn Gravel Co., Fort Smith, Ark., recently organized, is planning the development of 1500 acres at Albion, Okla., and will install a steam shovel, conveying and other equipment. M. S. Cohn is president.



The Tennessee Electric Power Co., Nashville, Tenn., is arranging an extension program to cost approximately \$18,000,000 during the next 36 months, to include the construction of a hydroelectric generating plant on the Caney Fork River, a steam-operated generating station for auxiliary service at Hales Bar on the Tennessee River, and a third hydroelectric generating plant on the Ocoee River. Another steam-operated plant in the vicinity of Hales Bar is also projected. For initial work, the company is disposing of a preferred stock issue of \$1,500,000. B. C. Edgar is vice-president and general manager.

The El Reno Ice Co., El Reno, Okla., has tentative plans for a new ice and refrigerating plant to cost \$65,000. Paul Liebmann is general manager.

The Tate Motor Co., St. Louis, is having plans completed for a three-story service and repair works, 125 x 165 ft., at Washington Boulevard and Garrison Avenue, to cost \$100,000. The Widmer Engineering Co., Laclede Gas Building, is architect and engineer.

The Owensboro Clay Products Co., Owensboro, Ky., has commenced the construction of a plant to manufacture brick, tile and kindred products, estimated to cost \$110,000, with machinery. John A. Bolger is head.

The Ferguson Hardware Co., Paducah, Ky., has tentative plans for a new four-story factory, 116 x 150 ft., to cost about \$165,000 with equipment.

The Hoshall Machinery Co., P. O. Box 187, Memphis, Tenn., has inquiries out for one 250 kva. generator, direct-connected to non-condensing, uniflow engine, with auxiliary equipment.

A machine shop will be installed in the three-story and basement automobile service and repair building, 65 x 245 ft., to be erected on Twenty-fourth Street, Kansas City, Mo., by A. F. Seested, 3271 Main Street, estimated to cost \$90,000. J. G. Braecklein, 703 Federal Reserve Life Insurance Co. Building, Kansas City, Kan., is architect.

The Hazel-Atlas Glass Co., Blackwell, Okla., with headquarters at Wheeling, W. Va., will commence the erection of a new power house at its local plant, 65 x 100 ft. A building, 100 x 175 ft., will also be erected at the main local works. The two structures will cost approximately \$90,000, including equipment.

The Waggoner Refining Co., Electra, Okla., is planning to rebuild the portion of its oil storage and distributing plant recently destroyed by fire with loss estimated at \$100,000, including equipment.

The Duncan Machinery Co., P. O. Box 265, Knoxville, Tenn., machinery dealer, has inquiries out for a 10 to 12-ton industrial locomotive, 36 in gage; also, for one air compressor, 150 to 200 cu. ft. capacity, direct-connected, gasoline driven.

The Common Council, Farmington, Mo., plans the installation of electrically-operated pumping machinery in connection with extensions and improvements in the municipal water works and sewerage system, estimated to cost \$100,000. Charles A. Haskins, Finance Building, Kansas City, Mo., is consulting engineer.

## The Pacific Coast

SAN FRANCISCO, Oct. 10.

PLANS have been prepared by the Stockham Pipe & Fitting Co., Los Angeles, for a new one-story plant, 100 x 145 ft., on Twenty-fourth Street, estimated to cost \$30,000. Frank D. Chase, Inc., Title Insurance Building, is architect and engineer.

The Des Chutes Power Co., Spokane, Wash., will make extensions in its power plant and system to cost about \$100,000, including the installation of additional equipment. Adolph Galland is president.

The Gold Seal Refining Corporation, Alhambra, Cal., formerly known as the Wadolene Refining Co., is planning the construction of a new oil refinery for the production of lubricating and other oil products, estimated to cost \$85,000.

The Board of Education, Los Angeles, has awarded a general contract to Callahan, Schilling & Brown, San Fernando Building, for a one-story vocational shop at the Jefferson high school, to cost about \$34,000 exclusive of equipment.

The Los Angeles Motor Bus Co., Los Angeles Railway Building, Los Angeles, has awarded a general contract to the Slater Co., 2314 Santa Fe Avenue, for a one and two-story service and repair building estimated to cost \$120,000.

The Climax Engineering Co., Clinton, Iowa, manufacturer of ice and refrigerating machinery, has tentative plans for a branch plant at Los Angeles, estimated to cost \$100,000 including equipment.

The Utah-Idaho Sugar Co., Salt Lake City, Utah, is considering plans for the construction of a new beet sugar

mill at Bellingham, Wash., with power house, machine shop and other buildings estimated to cost \$1,200,000.

The Board of Directors, Milner Canal System, Twin Falls, Idaho, has tentative plans for a new power house for its water system, estimated to cost \$125,000.

The Construction Quartermaster's Office, Fort Mason, Cal., has plans for a new power house at the new United States Army post, Anchorage, Alaska, to cost, with other buildings, \$700,000.

The Ord Ice Co., Oxnard, Cal., has plans for a new ice-manufacturing plant at the foot of Enterprise Street, to cost \$70,000. A. A. Miller, manager of the company at Ventura, Cal., will be in charge.

The Chevrolet Motor Co. of California, Oakland, has awarded a general contract to the Dinwiddie Construction Co., San Francisco, for a one-story and basement addition to its assembling and parts plant, to cost \$125,000 with equipment.

F. O. Stallman, 167-73 First Street, San Francisco, is desirous of locating a machine works in this section equipped to manufacture a small portable typewriter and parts, for Pacific Coast trade. Arrangements have been made with a number of such plants in the East, near distributing centers.

The Great Western Smelting & Refining Co., 75 Folsom Street, San Francisco, has awarded a general contract to the Hayes-Oser Co., Call Building, for a one-story foundry, 135 x 275 ft., to cost \$70,000, including equipment.

## Canada

TORONTO, Oct. 15.

**D**EMAND for machine tools the past week was somewhat stronger, with sales chiefly confined to small lots. According to inquiries received, many industrial plants are in need of tools for replacement purposes and selling interests are looking forward to a steady demand for equipment the remainder of the year. The automobile industry is steadily placing orders for machine tools in small numbers, both for replacement purposes and on new works account and the Canadian railroads are entering the market from time to time. A good demand is also reported for equipment and tools of a diversified character.

The McMullen-Perkins Co., is erecting a machine shop at Ottawa, Ont., to cost \$7,000 and is in the market for equipment.

The Pendrith Machinery Co., which is erecting an addition at 970 Queen Street West, Toronto, is inquiring for equipment.

The Lake of the Woods Milling Co., Montreal, will build an addition to its plant at Medicine Hat, Alta., to cost about \$500,000.

The Universal Wheel Co., which is establishing a plant at Windsor, Ont., is interested in machinery for manufacture of automobile disk wheels.

The Berliner Gram-o-phone Co., Ltd., Montreal, is completing a factory which with machinery will represent an expenditure of \$1,000,000.

The Haustine Co., Ltd., Dundas, Ont., manufacturers of sewage disposal systems, septic tanks, drinking fountains, etc., is building a new factory, which is expected to be ready for occupation the first of the year. With the addition now under way the company will be enabled to double its present output.

The Morrow Mfg. Co., recently incorporated to take over the business of W. L. Morrow & Co., Moncton, N. B., carriage manufacturer, is erecting a two-story and basement brick building at a cost of \$10,000. Machinery for a forge shop, etc., will be required.

The Dominion Tar & Chemical Co., Ltd., will establish a manufacturing plant at St. Boniface, Man., at a cost of \$250,000, according to O. P. Walsh, vice-president and general manager of the company. The company is a subsidiary of Burt, Boulton & Haywood, Ltd., London, England, and English capital will be invested in the Canadian plant.

The De Laval Co., Peterborough, Ont., manufacturer of dairy machinery, agricultural implements, etc., is building an addition, 42 x 114 ft., which will be used for pickling and tinning.

The Ottawa Electric Railway Co., Ottawa, Ont., has started work on the erection of a machine shop, power house and garage. A booster generator to cost \$50,000 will be purchased for the power house. Equipment for the machine shop and garage will also be required. Richards & Abra, Home Bank Building, are the architects. John Sutherland is superintendent in charge.

# Current Metal Prices

On Small Lots, Delivered from Merchants' Stocks, New York City

The following quotations are made by New York City warehouses.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipments in carload lots from mills, these prices are given for their convenience.

On a number of items the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Non-Ferrous Metals."

## Iron and Soft Steel Bars and Shapes

<b>Bars:</b>	
Refined iron bars, base price .....	3.54c.
Swedish charcoal iron bars, base.....	7.00c. to 7.25c.
Soft steel bars, base price .....	3.54c.
Hoops, base price .....	5.19c.
Bands, base price .....	4.39c.
Beams and channels, angles and tees, 3 in. x ¼ in. and larger, base .....	3.64c.
Channels, angles and tees under 3 in. x ¼ in. base .....	3.54c.

## Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger .....	3.60c.
(Smooth finish, 1 to 2½ x ¼ in. and larger) ..	4.10c.
Toe-calk, ½ x ¾ in. and larger.....	4.60c.
Cold-rolled strip, soft and quarter hard..	7.50c. to 8.50c.
Open-hearth, spring-steel .....	5.00c. to 7.50c.
<b>Shafting and Screw Stock:</b>	
Rounds .....	4.65c.
Squares, flats and hex.....	5.15c.
Standard tool steel, base price.....	15.00c.
Extra tool steel .....	18.00c.
Special tool steel .....	23.00c.
High speed steel, 18 per cent tungsten....	75c. to 80c.

## Tank Plates—Steel

¼ in. and heavier .....	3.64c.
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## Sheets

	Per Lb.
<b>Blue Annealed</b>	
No. 10 .....	4.59c.
No. 12 .....	4.64c.
No. 14 .....	4.69c.
No. 16 .....	4.79c.

## Box Annealed—Black

	Soft Steel C. R. One Pass Per Lb.	Blued Stove Pipe Sheet Per Lb.
Nos. 18 to 20.....	4.55c. to 4.80c.	.....
Nos. 22 and 24.....	4.60c. to 4.85c.	5.10c.
No. 26 .....	4.65c. to 4.90c.	5.15c.
No. 28 .....	4.75c. to 5.00c.	5.25c.
No. 30 .....	4.95c. to 5.20c.	.....

No 28 and lighter, 36 in. wide, 20c. higher.

## Galvanized

	Per Lb.
No. 14 .....	4.85c. to 5.10c.
No. 16 .....	5.00c. to 5.25c.
Nos. 18 and 20 .....	5.15c. to 5.40c.
Nos. 22 and 24 .....	5.30c. to 5.45c.
No. 26 .....	5.45c. to 5.70c.
No. 27 .....	5.60c. to 5.85c.
No. 28 .....	5.75c. to 6.00c.
No. 30 .....	6.20c. to 6.50c.

No. 28 and lighter, 36-in. wide, 20c. higher.

## Welded Pipe

<b>Standard Steel</b>		<b>Wrought Iron</b>	
Black	Galv.	Black	Galv.
½ in. Butt.. —41	—24	½ in. Butt.. —4	+19
¾ in. Butt.. —46	—32	¾ in. Butt.. —11	+9
1-3 in. Butt. —48	—34	1-1½ in. Butt —14	+6
2½-6 in. Lap. —44	—30	2 in. Lap..... —5	+14
7-8 in. Lap.. —41	—11	2½-6 in. Lap —9	+9
9-12 in. Lap. —34	—6	7-12 in. Lap. —3	+16

## Steel Wire

	Per Lb.
<b>BASE PRICE* ON NO. 9 GAGE AND COARSER</b>	
Bright basic .....	5.00c.
Annealed soft .....	5.00c.
Galvanized annealed .....	5.65c.
Coppered basic .....	5.65c.
Tinned soft Bessemer .....	6.65c.

\*Regular extras for lighter gage.

## Brass Sheet, Rod, Tube and Wire

	BASE PRICE
High brass sheet .....	17½c. to 18½c.
High brass wire .....	18 c. to 19 c.
Brass rods .....	15¼c. to 16¼c.
Brass tube, brazed .....	25½c. to 27 c.
Brass tube, seamless .....	22½c. to 23½c.
Copper tube, seamless .....	24 c. to 25 c.

## Copper Sheets

Sheet copper, hot rolled, 20¼c. to 21¼c. per lb. base.
Cold rolled, 14 oz. and heavier, 3c. per lb. advance over hot rolled.

## Tin Plates

<b>Bright Tin</b>		<b>Coke—14 x 20</b>	
Grade "AAA" Charcoal 14x20	Grade "A" Charcoal 14x20	Prime	Seconds
IC.. \$12.55	\$10.70	80 lb.. \$6.55	\$6.30
IX.. 13.95	12.55	90 lb.. 6.65	6.40
IXX.. 15.55	13.75	100 lb.. 6.75	6.50
IXXX.. 17.10	15.30	IC.. 7.00	6.75
IXXXX.. 18.85	16.80	IX.. 8.25	8.00
		IXX.. 9.50	9.25
		IXXX.. 10.75	10.50
		IXXXX.. 12.00	10.75

## Terne Plates

	8 lb. coating, 14 x 20
100 lb. ....	\$7.00 to \$8.00
IC .....	7.25 to 8.25
IX .....	8.25 to 8.75
Fire door stock .....	9.00 to 10.00

## Tin

Straits pig .....	44c.
Bar .....	48c. to 50c.

## Copper

Lake ingot .....	16c.
Electrolytic .....	15½c.
Casting .....	15c.

## Spelter and Sheet Zinc

Western spelter .....	7¼c.
Sheet zinc, No. 9 base, casks.....	10½c. open 11c.

## Lead and Solder\*

American pig lead .....	8¼c. to 8¾c.
Bar lead .....	10c. to 12c.
Solder ½ and ½ guaranteed .....	31c.
No. 1 solder .....	29c.
Refined solder .....	25c.

\*Prices of solder indicated by private brand vary according to composition.

## Babbitt Metal

Best grade, per lb. ....	75c. to 90c.
Commercial grade, per lb.....	35c. to 50c.
Grade D, per lb.....	25c. to 35c.

## Antimony

Asiatic .....	9c. to 9½c.
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## Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb.....	36c.
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## Old Metals

The market is very depressed and values are lower. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy crucible .....	11.00
Copper, heavy wire .....	10.50
Copper, light bottoms .....	8.75
Brass, heavy .....	5.75
Brass, light .....	4.75
Heavy machine composition .....	8.50
No. 1 yellow brass turnings .....	5.75
No. 1 red brass or composition turnings.....	7.25
Lead, heavy .....	6.00
Lead, tea .....	5.00
Zinc .....	4.00
Cast aluminum .....	15.00
Sheet aluminum .....	15.00